

It is with the deepest regret that I have to record the untimely death of the senior author, Reverend Father ETHELBERT BLATTER, who died at St. Vincent's High School, Poona, on the 26th May, 1934. BLATTER was born in Switzerland on the 15th December 1877.

C. McCANN.

The Imperial Council of Agricultural Research.

THE BOMBAY GRASSES

BY

E. BLATTER, S.J., Ph.D., F.L.S.,

AND

C. McCANN, F.L.S.,

Assistant Curator, Bombay Natural History Society.

Illustrated

BY

R. K. BHIDE,

Economic Botanist, Department of Agriculture, Hyderabad-Deccan.



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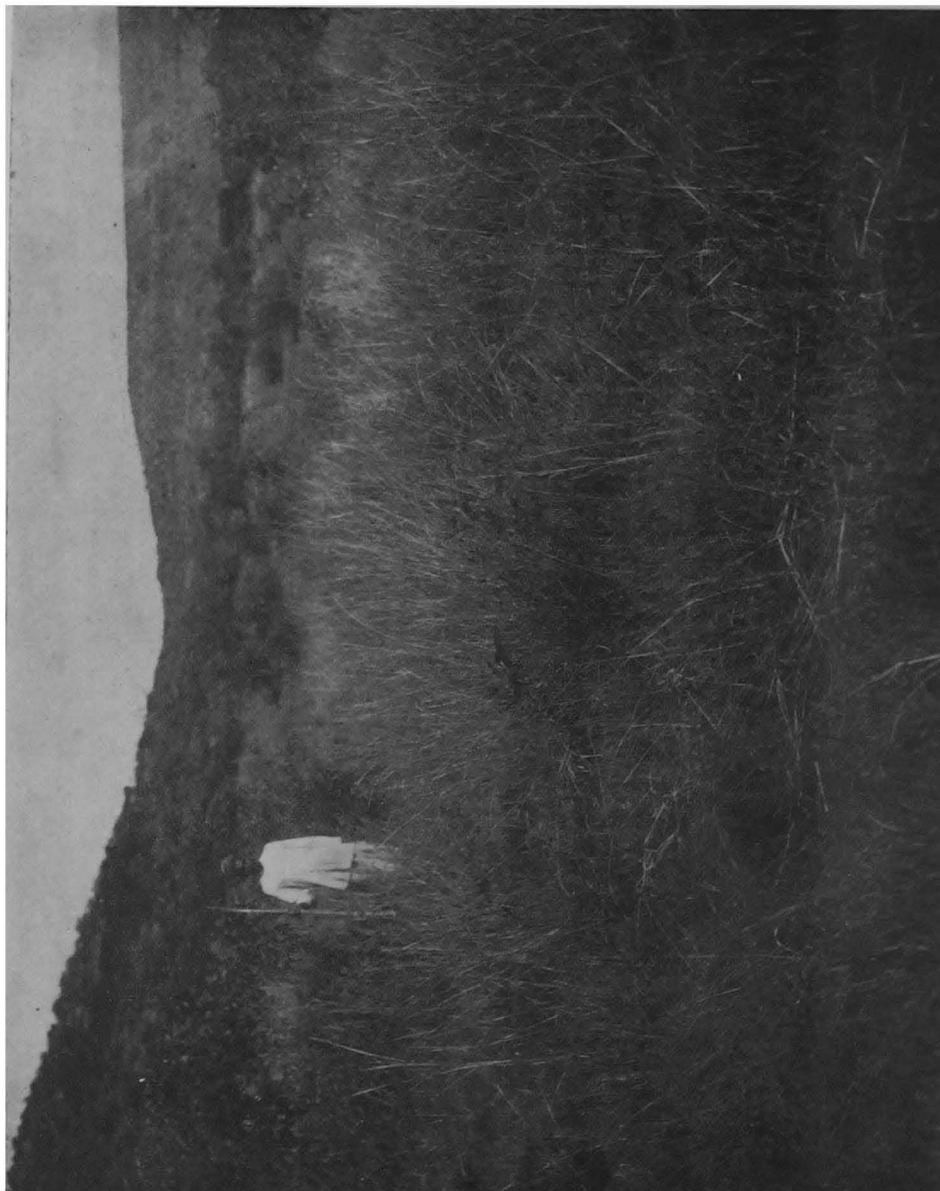
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**A field containing a stand of *Chrysopsis montanus* Trin. and *Selima nervosum* Stapf with scattered *Heteropogon insignis* Thw.
Photo by**

PREFACE

There are several reasons which have induced us to publish this monograph.

Since T. Cooke's treatment of this family in his *Flora of Bombay* (1908), a number of new species have been described, and we have been able to add over 60 species which are new to the Presidency.

More important than the numerical additions are the changes made during the last fifteen years with regard to the general arrangement of the grasses and the definition of certain genera. A great amount of work has been done in Europe as well as in America. In Europe it was chiefly O. Stapf who, with his vast experience of the grass-flora of many countries and the rich material of the Kew Herbarium at his disposal, has advanced our knowledge of the grasses and their systematic co-ordination more than anybody else. A comparison of his monograph of the grasses in the *Flora of Tropical Africa* which is still in progress with that of the *Flora Capensis* shows at once in which direction and to what extent progress has been made. As regards the second subfamily (*Pooideae*) the two works reveal only minor changes, but considerable changes were found necessary in the first subfamily (*Panicodeae*). Here again it is chiefly the genera *Andropogon* and *Panicum* and their allies which have been affected. In this respect, especially where the tribe of *Panicaceae* is concerned, we owe a good deal to American botanists. It was chiefly the fact that there were no definite dividing lines for the genera of *Andropogoneae* and *Panicaceae*, that induced Stapf not "to unite the groups wherever intermediate links can be detected," which would bring about endless confusion, but "to be satisfied with approximately definable groups, which can on the whole be easily grasped and remembered." In other words, it is preferable from a practical point of view to adopt smaller genera than unmanageable large genera for merely theoretical reasons. As the Kew Herbarium, as far as the grasses are concerned, owes its systematic arrangement chiefly to Stapf, and as colonial workers will always appeal to Kew in their difficulties, we thought it advisable to follow Stapf in the definition and sequence of the tribes as laid down in the *Flora of Tropical Africa*.

As of late the grass problems have received renewed attention by the Agricultural Departments in India, we do not consider it superfluous to bring the systematic account of the grass-flora of Bombay up-to-date. It is worthwhile quoting a passage from R. S. Hole (in *Agric Journ of India*, Special Indian Science Congress number, 1917). "It may be said that systematic work . . . is of no economic importance and should form no part of the duties of a so-called Economic Botanist. To some extent this opinion appears to be due to ignorance of the methods, difficulties, and scope of systematic work. For a considerable period systematic botany held the field in India. The idea then gained ground that a great deal of systematic botany dealt with species of no value and this eventually led to a strong swing of the pendulum in the direction of so-called economic botany. This resulted in a provision for the economic study of agricultural plants at the Pusa Research Institute and of forest plants at the Dehra Dun Research Institute. The improvement of agricultural crops does not fall within the scope of ordinary systematic botany which deals with wild species. As regards forest plants, however, it is perfectly clear that sound progress in economics is impossible without an extended study of systematics. The non-botanist is apt to think that, with the publication of the *Flora of British India* and the formation of good herbaria at Calcutta, Dehra Dun, and elsewhere, systematic work has been completed and has no further scope in India. This, however, is far from being the case. Systematic work is at first necessarily tentative and when, in India, we undertake the detailed study of species in connection with the exploitation of the commercial products yielded by them, which necessitates the identification of large numbers of individuals occurring over extensive areas and the separation of all individuals belonging to species of commercial value from those which belong to valueless but nearly related species, we are forced to recognize the fact that the descriptions in the Floras drawn up from a few often imperfect specimens are more or less fragmentary and not infrequently misleading."

Regarding the descriptions of genera and species we have not made the slightest attempt to be in any way original, thinking that the diagnosis of plants or groups of plants is not the right place for originality. It would be easy to change the sequence of words or to borrow some details from one description, and others from some other book, but it would not tend towards an uniform treatment of the subject and the final result would certainly not be satisfactory. We have, therefore, borrowed a good description where we found one and, in this respect, we have to be especially grateful to Hook f., Stapf, Cooke and Haines.

For the two classes of glumes we have adopted the terms involucrel and floral. As to other terms used we refer to the general characters of the family.

In the key we have, wherever possible, closely adhered to Stapf in vol. IX of Prain's *Flora of Tropical Africa*.

We have made the synonymy as complete as possible. We thought this to be not only useful but necessary, especially in a country where very few people have access to good botanical libraries and where many a worker has to rely on some odd books, sometimes of a very early date. Everybody will thus be enabled to co-ordinate the old or antiquated names with the more recent ones.

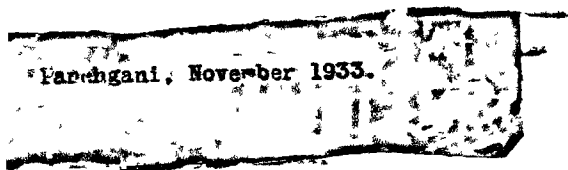
Regarding the vernacular names we mention chiefly those which are known in the Bombay Presidency. We have not been in a position to examine them critically, not even superficially and, therefore, not much reliance should be put on them.

Of herbaria we have seen the following : Calcutta, Dehra Dun, Gujarat College, St. Xavier's College, Poona (Science College, Herbarium of the Economic Botanist, and Talbot's Herbarium), Lisboa's collections and the private herbarium of L. J. Sedgwick and T. R. Bell, and our own collections.

The preliminary revision of the Bombay Grasses was published by us in the *Journal of the Bombay Natural History Society*, Vol. XXXII-XXXIV (1927-30).

It now remains to express our deep gratitude to all those who have helped us in this work. Mr. C. E. C. Fischer and Mr. C. E. Hubbard of the Kew Herbarium were always ready to reply to our numerous inquiries and Dr. Stapf obliged us in many ways. We can say the same of several other members of the staff at Kew. Equal thanks are due to Dr. W. Burns, Director, Department of Agriculture, Bombay Presidency and Mr. K. Biswas, Curator of the Calcutta Herbarium. Dr. A. D. Blaschek, President of the Forest Research Institute and College, Dehra Dun has been kind enough to permit the reproduction of 4 plates from Hole's Forest Grasses.

An asterisk in front of a name means that the particular genus or species has been introduced.



E. BLATTER.

C. McCANN.

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THE BOMBAY GRASSES

BY

E. BLATTER, S.J., Ph.D., F.L.S.,

AND

C. McCANN, F.L.S.,

Assistant Curator, Bombay Natural History Society.

Illustrated

BY

R. K. BHIDE,

Economic Botanist, Department of Agriculture, Hyderabad-Deccan.

GRAMINEAE

Erect decumbent or creeping herbs (rarely suffruticose), or in Tribe *Bambuseae* shrubs or trees; stems usually branched at the base, terete or compressed, with hollow or solid internodes. Leaves distichous, simple, usually long and narrow, generally parallel-nerved, with a sheathing base (sheath) distinct from the blade and rarely an interposed petiole; sheath split to the base (very rarely entire), with usually a transverse erect appendage (ligule) consisting of a membrane or a fringe of hairs at the union with the blade.

Inflorescence terminal (rarely terminal and lateral), composed of variously arranged spikelets, panicle, racemose, capitate, simply or compoundly spicate (rarely of a single spikelet). Spikelets consisting of an axis (rachilla) and typically of 3 or more alternate distichous more or less heteromorphous bracts (glumes), of which the 2 lowest (involucral glumes) form an involucre to the spikelet and are empty, while the following (floral glumes) bear in their axils subsessile flowers subtended by a hyaline 2-keeled or 2-nerved dorsal scale (palea); floral glumes differing usually in structure and size from the involucral glumes, and forming with the palea and the flower proper false flowers (florets), which are alike or different in structure and sex. Flowers hermaphrodite or 1-sexual (often with the rudiments of the other sex), consisting of 2 (rarely 3) minute hyaline fleshy scales (lodicules) which represent a perianth (sometimes absent), and of stamens or a pistil or both. Stamens usually 3 (rarely 6, 4, 2, or 1, very rarely more), hypogynous; filaments slender, usually free, anthers versatile, fugacious, with 2 parallel cells, usually dehiscent by a longitudinal slit. Ovary entire, 1-celled, ovule erect, anatropous; styles 2 (rarely 3 or 1), free or connate at the base, usually elongate and exserted from the apex or sides of the spikelet, clothed with simple or branched stigmatic hairs.

Fruit a seed-like grain, free within the flowering glume and palea or adnate to either or both; pericarp very thin (rarely thick and separable from the seed). Seed erect; albumen copious, floury; embryo minute, at the base of and outside the albumen; cotyledon shield-shaped with an erect conical plumule and a descending conical radicle.

Genera about 483. Species over 5,870.—In all regions of the world.

KEY TO THE GENERA.

We follow, where possible, the systematic arrangement given by Stapf in the Flora of Tropical Africa.

SUBFAMILY I: PANICOIDEAE.—Mature spikelets falling entire from their pedicels or with them, all alike or differing in sex and structure, perfect spikelets with 2 heteromorphous florets, the upper hermaphrodite, the lower male or barren; rhachilla not continued beyond the upper floret (Genera 1-62).

Tribe I: Mayideae.—Sexes in different inflorescences on the same plant or the female spikelets at the base of the inflorescence, the male above them, spikelets never awned, the male and female very dissimilar (Genera 1-4).

1. Male and female spikelets in separate inflorescences, male spikelets in a large terminal panicle; the female spikelets in the axils of the leaves.
 - a. Female spikelets distinct, articulated 1. *Euchlaena*.
 - b. Female spikelets grown together into a spongy more or less cylindrical body 2. *Zea*.
2. Male and female spikelets in separate portions of the same spike, the female below.
 - a. Grain enclosed in the usually globose or ovoid ivory-like capsuliform supporting sheath 3. *Coix*.
 - b. Grain enclosed in the hardened outer glumes 4. *Polytaea*.

Tribe II: Andropogoneae.—Spikelets usually in pairs, one sessile, the other pedicelled, very rarely both pedicelled, those of each pair alike as to sex (homogamous) or different (heterogamous), rarely 3-nate or solitary on the axis of a usually spike-like raceme. Involucral glume more or less rigid and firmer than the floral glumes, the lower always longer than the florets; floral glumes membranous, often hyaline, that of the upper floret usually awned or reduced to an awn (Genera 5-41).

1. SUBTRIBE: DIMERINAE.—Spikelets homogamous, secund on a slender articulate rhachis, 1-flowered, diandrous 5. *Dimeria*.
2. SUBTRIBE ISCHAEMINAE.—Fertile spikelets 2-flowered; fertile floret awned from the sinus of the bifid or bidentate upper floral glume (sometimes awnless) in *Apluda* (Genera 6-13)
 - a. Group *Ischaemastreae*.—Racemes several to many-noded, espatheate, spikelets of each pair homogamous or more often heterogamous, usually similar in shape and nervation, rarely distinctly heteromorphous, fertile spikelets awned (Genera 6-13).
 - * Margins of lower involucral glume of sessile spikelet inflexed.
 - † Stem not woolly below, joints and pedicels stout; spikelets heterogamous (Genera 6-8)
 - ‡ Spikes clustered; lower involucral glume not channelled 6. *Ischaemum*.
 - ‡‡ Spikes solitary; lower involucral glume usually channelled 7. *Schinus*.
 - ‡‡ Rootstock and base of stem clothed with woolly sheaths; spikelets similar and homogamous 8. *Pollinidrum*.
 - ** Margins of lower involucral glume of sessile spikelet not inflexed (Genera 9-12).

- † Spikes solitary; spikelets 2-nate, 1-2-flowered, 2-awned 9. *Pogonatherum*.
- †† Spikes solitary or 2-nate, spikelets 2-flowered, diandrous, lower involucre glume very broad truncate 10. *Apocopsis*.
- ††† Spikes digitate; spikelets 2-flowered; lower involucre glume tubercled 11. *Thelepogon*.
- †††† Spikes 2-8-nate; spikelets 2-nate, upper alone awned 12. *Lophopogon*.
- b. Group Aphudastrae*.—Racemes 1-noded, reduced to 3 heteromorphous spikelets, the sessile with a male and a hermaphrodite floret and an inflated callus, one pedicelled with 2 male florets, the other rudimentary on a glume-like pedicel, fertile florets awned or awnless 13. *Aphuda*.
- 3. SUBTRIBE: ROTBOELLINAE.—Fertile spikelets 1- or 2-flowered; fertile florets awnless (Genera 14-21).
 - Group Rotboelliastrae*.—Racemes at the ends of the culms and their branches in a false (rarely true) spatheate panicle or solitary and terminal on simple or sparingly branched culms
 - a* Spikelets all alike, also as to sex, racemes tough or tardily disarticulating, much compressed, joints and pedicels fused 14. *Hemarthria*.
 - b* Spikelets of each pair more or less dissimilar, at least as to sex, the pedicelled male, neuter or suppressed (Genera 15-21).
 - * Sessile spikelets small, globose, foveolate, 1-flowered, pedicelled very dissimilar, joints and pedicels fused 15. *Manisuris*.
 - ** Sessile spikelets not globose (Genera 16-21)
 - † Sessile spikelets winged from the transversely rugose or mucronate lower involucre glumes, 1-flowered, pedicelled very dissimilar, joints and pedicels fused 16. *Peltophorus*.
 - †† Sessile spikelets not winged (Genera 17-21).
 - ‡ Racemes usually more or less villous, very rarely glabrous, never cylindrical; joints and pedicels moderately stout, gaping.
 - § Spikelets 2-flowered, very villous all over, the sessile sometimes 2 at a node and sub-opposite 17. *Lasurus*.
 - §§ Spikelets 1-flowered; racemes more or less villous from the joints and pedicels or the edges of the spikelets, rarely glabrous; lower involucre glume with a transparent oil-duct inside each keel or a fringe of penicillate warts 18. *Elyonurus*.
 - ††† Racemes glabrous, cylindrical, particularly when the spikelets are closed (Genera 19-21).
 - § Pedicels and joints fused
 - ¶ Racemes stout, few from each culm, sessile spikelets 2-flowered, pedicelled male or neuter 19. *Rotboellia*.
 - ¶¶ Racemes slender in ample spatheate panicles; sessile spikelets 1-flowered 20. *Ophirus*.
 - §§ Pedicels free from the joints, racemes usually in terminal and lateral spatheate fascicles or fastigate panicles; coarse tall grasses 21. *Coelorhachis*.
 - 4. SUBTRIBE: SACCHARINAE.—All spikelets alike in shape and sex, or if different in sex, then the pedicelled female (Genera 22-25).
 - a. Group Saccharastrae*.—Racemes in more or less compound panicles or racemously arranged

- on an elongated common axis; spikelets 1-flowered; awn from the sinus of the 2-dentate floral glume or from the tip of the entire valve or O (Genera 22-24).
- * Rhachis quite tough, racemes in spike-like or thyrsoid solitary panicles, all spikelets pedicelled, mucous 22. *Imperata*.
 - ** Rhachis of racemes readily disarticulating
 - † Spikelets in a wide, often thyrsoid, more or less plumose and silvery panicle, 2-flowered, usually awned, rarely mucronate or awnless 23. *Saccharum*.
 - †† Spikelets in panicle racemes, 2-flowered, awned 24. *Spodiopogon*.
 - b. Group Pollumstrae*—Racemes digitate, rarely solitary, spikelets 1-2-flowered; awn from the sinus of the 2-fid or 2-dentate floral glume, spikelets dorsally compressed; callus short, obtuse 25. *Eulalia*.
5. SUBTRIBE. ANDROPOGONINAE—Spikelets of each pair different in sex and frequently also in shape and size, or if those of some pairs of a raceme are alike in sex, then both male or neuter, fertile spikelets 1-flowered (Genera 26-41).
- a. Racemes in more or less compound espatheate panicles, pedicels without a translucent middle line (Genera 26-29).*
 - Group Sorghastrae*—Pedicelled spikelets male, neuter or suppressed (including the pedicel in *Cleistachne*). awn from the sinus of the 2-fid floral glume.
 - * Spikelets dorsally compressed, at least when in flower; lower involueral glume of the fertile spikelets firmly chartaceous to coriaceous
 - † Spikelets in threes, one of them fertile, or in racemes of 2-8 pairs the pedicelled male, neuter, or if quite suppressed then at least the pedicels present 26. *Sorghum*.
 - †† Spikelets solitary 27. *Cleistachne*.
 - ** Spikelets laterally more or less compressed.
 - † Racemes of many pairs of spikelets, primary branches of panicles in whorls of 6-20 28. *Vetiveria*.
 - †† Racemes usually reduced to 1 sessile hermaphrodite and 2 pedicelled male or barren spikelets, rarely of 2 or more but always few pairs 29. *Chrysopogon*.
 - b. Racemes not in compound espatheate panicles or if so (Capillipedium) then the pedicels with a translucent middle line (Genera 30-41).*
 - * Fertile floral glume awned from low down on the back.
 - Group Arthraxonstrae*—Sessile spikelets convex on the back and rounded on the sides, often mucronate, particularly along the sides, pedicelled usually rudimentary or O, rarely male, racemes digitate 30. *Arthraxon*.
 - ** Fertile floral glume awned from the sinus of a 2-fid or 2-dentate valve or continuing the more or less stipitate floral glume (Genera 31-41).
 - † Margins of the lower involueral glume of the fertile spikelets inflexed and the glume therefore sharply 2-keeled more or less all along with a short obtuse callus, rarely the keels rounded off downwards with the margins subinvolute, but then the back of the glume deeply sunk

KEY TO THE GENERA.

between the keels and the callus short or long and acute; awn glabrous or scabrid, very rarely hirsute (*Andropogon* sp.); spikelets awned (Genera 31-37).

‡ Awn forming a continuation of the stipitiform fertile floral glume.

Group Amphilophastrae—Racemes digitate or racemously digitate, and then usually very numerous, all more or less peduncled on simple or almost simple culms, or solitary at the end of the culms and their branches and sometimes gathered into a scanty spatheate false panicle, rarely in compound espatheate panicles (*Capillapedum*) (Genera 31-34)

§ Racemes in compound espatheate panicles . . . 31. *Capillapedum*.

§§ Racemes not in compound espatheate panicles (Genera 32-34).

¶ Racemes digitate, or many racemously arranged on a common axis shorter than the raceme (Genera 32-34).

|| Sessile spikelets of all pairs hermaphrodite, awned . . . 32. *Amphiphiis*.

||| Sessile spikelets of the lowest 1-3 or 4 pairs male or neuter and awnless . . . 33. *Dichanthum*.

¶¶ Racemes solitary at the ends of the culms and branches . . . 34. *Eremopogon*.

‡‡ Awn from the sinus of the 2-fid or 2-dentate fertile floral glume (Genera 35-37).

§ *Group Schizachyrrastrae*—Racemes solitary at the ends of the culms and their branches, the branches usually gathered into a narrow, lax, spatheate false panicle; joints and pedicels thickened upwards; pedicelled spikelets male, neuter or suppressed . . . 35. *Schizachyrrum*.

§§ *Group Andropogonastreae*—Racemes 2-nate at the end of simple or almost simple culms or gathered into spatheate false or true panicles.

¶ Racemes 2-nate on a slender peduncle arising from a flattened spathe, sessile spikelets alike in sex and form, joints opaque . . . 36. *Andropogon*.

¶¶ Racemes 2-nate, with a spathe supporting or surrounding each pair, gathered into often much decompound spatheate panicles; the lowest pair of one of the racemes homogamous, male or neuter, all pairs of the other heterogamous; mostly aromatic grasses . . . 37. *Cymbopogon*.

‡‡ Margins of the lower involucrel glume of the fertile spikelets involute, inflexed and 2-keeled (if at all) only close to the tips, the spikelets therefore with rounded sides or quite terete; callus elongate and acute or pungent; awn more or less hirsute, from the stipitiform floral glume (Genera 38-41).

‡ *Group Heteropogonastreae*—Racemes many-noded, solitary, all pairs of spikelets heterogamous and alike or the lowest 1-many homogamous and barren, very different from the fertile, not forming an involucre around them . . . 38. *Heteropogon*.

‡‡ *Group Themedastrae*—Racemes fasciculiform, solitary at the apex of the stem and branches. Spikelets dimorphic, the 4 lower sessile forming an involucre round the upper.

§ Rhachis articulate below the involucrel spikelets . . . 39. *Iscilema*.

- §§ Rhachis articulate above the involucrel spikelets . . . 40. *Themeda*.
 ††† Group *Pseudothedastrae*—Like *Themedastrae*
 above, but without the involucrel spikelets
 of that group . . . 41. *Pseudanthistiria*.

Tribe III: Paniceae.—Spikelets in usually contan-
 uous spikes, racemes or panicles. Involucrel glumes
 herbaceous or membranous, the lower generally smaller,
 very small or suppressed. Lower floral glume generally
 resembling the involucrel glumes in structure and nervation,
 the upper fertile firmer, at length rigid, often
 chartaceous or crustaceous, awnless, very rarely mucronate
 (*Urochloa*) (Genera 42-62)

1. **SUBTRIBE PANICINAE.**—Upper floret only fertile, lower
 floral glume usually resembling the upper involucrel
 glume, not indurated (Genera 42-61).

A. Undershrubs; flowers dioecious

- Group *Spinifoliae*—Male spikelets 2-flowered, articu-
 late in rigid umbellate spikes, female in
 large globose heads of stellately spreading
 quill-like rhachis, one spikelet at the base
 of each . . . 42. *Spinifex*.

B Herbs; flowers not dioecious (Genera 43-61)

- a. Group *Digitariastrae*.—Inflorescence of usually
 slender, spiciform, digitate or subdigitate
 or somewhat distant, very rarely solitary
 racemes; fruiting floral glume with usually
 flat, thin to hyaline margins, thinly
 cartilaginous, often brown or dark, with the
 usually minute, often microscopic, scale-like
 palea of the barren floret attached to the
 base.

- * Spikelets awnless; lower involucrel glume minute,
 rarely 0, lower floral glume usually with
 5-7 close, straight, prominent nerves . . . 43. *Digitaria*.

- ** Spikelets slender awned . . . 44. *Alloteropsis*.

- b. Inflorescence usually different (but see *Axonopus*
 and *Paspalum*), fruiting floral glume with
 more or less inrolled margins, usually
 crustaceous and straw-coloured or whitish;
 palea of the barren floret, if developed,
 not attached to the false fruit (Genera
 45-61)

- * Spikelets falling entire and singly from the persistent
 pedicels (Genera 45-54)

- † Group *Paniculastrae*.—Spikelets not awned, or if
 awned, then subsessile in false secund
 variously arranged spikes and with the
 awns from the entire tips of the upper
 involucrel glume and lower floral glume
 (*Echinochloa* sp) or from the tips of both
 involucrel glumes or at least the lower
 (Genera 45-58)

- ‡ Inflorescence of variously arranged (rarely solitary)
 simple or compound, usually secund, spike-
 like, dense (rarely loose) racemes, not an
 open or contracted and cylindric panicle;
 spikelets usually paired or sometimes particu-
 larly towards the base of the raceme in
 fascicles of 3 (rarely more) unequally pedi-
 celled or solitary, alternately to the right
 and the left of the median line of a usually
 dorsiventral rhachis; fruit dorsally (very

- rarely laterally) compressed, its glume and palea crustaceous, racemes usually rather dense (Genera 45-52)
- ¶ Back of fruit abaxial (Genera 45-47)
- || Spikelets strongly laterally compressed, distant on long slender rhachises, lower involucrel glume herbaceous, as long as the spikelet 45. *Pseudechnolaena*.
- ||| Spikelets more or less dorsally compressed, lower involucrel glume never herbaceous
- H Lower involucrel glume rudimentary with a swollen annular callus at the base of the rhachilla, fruit mucronate 46. *Eriochloa*.
- HH No swollen annular callus at the base of the spikelet
Lower involucrel glume present, racemes racemously arranged 47. *Bracharia*.
- ¶¶ Back of the fruit adaxial (Genera 48-52).
- || Lower involucrel glume typically absent, spikelets usually conspicuously plano-convex, with the flat side turned away from the rhachis 48. *Paspalum*.
- ||| Lower glumes developed, rhachis persisting, not articulate, spikelets falling from the pedicels (Genera 49-52)
- H Involucrel glumes neither awned nor caudate, if shortly cuspidate-acuminate, then the fruiting floral valve obtuse with an imposed mucro and the margins involute all along
- T Fruiting flowering glume acute, not mucronate, spikelets solitary, closely bisetate, contiguous with their sides, false spikes rigid, not several times longer than the internodes of the long common axis, their lower parts more or less appressed to the alternately hollowed out flanges of the latter 49. *Paspalum*.
- TT Fruiting flowering glume obtuse, abruptly mucronate or aristulate, spikelets solitary or paired, when solitary contiguous with their backs, false spikes often flexuous or curved, usually several times longer than the internodes of the relatively short common axis, spreading from the base 50. *Urochloa*.
- HH Glumes caudate or cuspidate-acuminate or awned.
- T Glumes awned from the entire acute or acuminate tip, or caudate or cuspidate-acuminate; margins of the fruiting flowering glume flat upwards, not embracing the tip of the palea; racemes dense, more or less secund, often very numerous 51. *Echinochloa*.
- TT Glumes awned from the slightly notched tips; racemes elongated or short to very short, secund, compact, spreading from the common axis 52. *Oplismenus*.
- ‡‡ Inflorescence an open panicle, rarely contracted, cylindrical and spike-like (*Sacciolepis*, *Setaria* sp.) (Genera 53-58).
- § Spikelets not supported by bristle-like branches (Genera 53-57).
- ¶ Spikelets not gibbous or, if slightly so, then not in cylindrical false spikes (Genera 53-56).
- || Branches of panicle not adnate to the main axis.
- H Panicle much contracted, dense, very compound, with erect narrowly lanceolate spikelets; lower floral glume beaked, upper floral glume rather thin 53. *Hymenachne*.

- HH Panicle usually open, lower floral glume not beaked, upper floral glume crustaceous 54. *Panicum*.
- |||| Branches of panicles more or less adnate to the main axis so that the pedicels appear to spring more or less directly from the axis 55. *Sacciolepis*.
- ||||| Branches of the panicle produced beyond the uppermost spikelets, lower involucrel glume minute, orbicular, white, hyaline 56. *Pseudoraphis*.
- ¶¶ Spikelets distinctly gibbous, laterally much compressed 57. *Cyrtococcum*.
- §§ All the spikelets or only the upper of each branch supported by bristle-like branches 58. *Setaria*.
- †† Group *Melnustrae*.—Spikelets finely awned or mucronate from the notched tips of the upper involucrel glume and barren floral glumes (or if mucicous, these at least slightly notched) delicately pedicelled, panicled; lower involucrel glume very minute. Upper involucrel glume and barren floral glume gibbous at or below the middle, both 5-nerved, nerves hidden by copious and long silky hairs and anastomosing below the obtuse tips 59. *Tricholaena*.
- ** Spikelets falling in groups, or if singly then surrounded by an involucrel of bristles or at least supported by 1 to several bristles
- Group *Cenchastrae*.—Spikelets falling by an involucrel of bristles or spines or bract-like scales, or at least supported by 1-several bristles, or with the lower involucrel glumes of each group forming a false involucre
- † Involucre of free naked or plumose bristles 60. *Pennisetum*.
- †† Involucres of spines or rigid bristles united at the base into a hard cup 61. *Cenchrus*.
2. SUBTRIBE ISACHNINAE.—Both florets fertile, or if the lower male, then its floral glume more or less resembling that of the upper floret and indurated
- Group *Isachnastrae*.—Florets very similar, spikelets more or less panicled 62. *Isachne*.

SUBFAMILY II: POOIDEAE.—Mature spikelets breaking up, leaving the persistent or sub-persistent glumes on the pedicel, or if falling entire, then not consisting of 2 heteromorphous florets as in *Panicoidae* (Genera 63-110).

1. Blades not articulated on the sheath, rarely (*Cenotheca*) transversely veined (Genera 63-105)
- a Awn of the fertile floret, if present, kneed and twisted below the knee, or straight in reduced forms (Genera 63-79).
- * Florets 2 or more (Genera 63-70).

Tribe IV: Arundinellae.—Florets 2, heteromorphous, the lower awnless, or barren Rhachilla not continued beyond the upper floret. Lower floral glume awnless, rather resembling the involucrel glumes; upper generally awned, at length firm or hard, awn from the sinus between 2, sometimes minute or bristle-like, lobes, rarely from the entire obtuse tip, usually kneed and twisted below the knee.

- † Upper floral glume 2-setose, minutely 2-toothed or entire, awn sometimes reduced 63. *Arundinella*.
- †† Upper floral glume always distinctly 2-toothed or 2-lobed; awn always kneed; spikelets in clusters of 3 64. *Tristachya*.

Tribe V : Aveneae.—Florets 2-many, all alike, except the uppermost which often are reduced. Floral glumes with hyaline shining margins or firmer, 5- or more-nerved, rarely 3-nerved; awn, if present, from the back or sinus or between bristles

† Floral glumes awnless or awned from the back; florets 2 or more, the uppermost reduced.

‡ Spikelets 2- or more-flowered, awned . . . 65. *Avena*.

‡‡ Spikelets 2-flowered, awnless . . . 66. *Coelachne*.

†† Floral glumes awned from the sinus of the bifid tip, florets 3-many, the uppermost reduced . . . 67. *Danthoma*.

Tribe VI : Arundineae.—Florets 2-many, enveloped in very long hairs, springing either from the callus or from the back or margins of the floral glumes.

† Hairs springing from the margins of the upper floral glume . . . 68. *Thysanolaena*.

†† Hairs springing from the callus . . . 69. *Phragmites*.

††† Hairs springing from the involucrel glumes . . . 70. *Arundo*.

** Floret 1 (Genera 71-79).

Tribe VII : Agrostae.—Floret 1 Rhachilla rarely produced beyond the floret, upper floral glume membranous, not changed when mature, usually 5-nerved, all the nerves or the outer side-nerves often slightly excurrent, parallel or at least not anastomosing. Spikelets awned or not

† Spikelets in cylindric spike-like panicles, not awned . . . 71. *Heleochoa*.

†† Spikelets in open or contracted many-flowered panicles, awned

‡ Involucrel glumes acuminate or awned . . . 72. *Garnotha*.

‡‡ Involucrel glumes awned from the notched or lobed tips . . . 73. *Polypogon*.

Tribe VIII : Stipeae.—Floret 1 Rhachilla not produced beyond the upper floral glume which is bisexual, hardened when mature, tightly enveloping the fruit, nerves joining or closely approaching at the tip. Awn terminal, rarely absent

Awns 3, from the entire tip, or 1, simple below and 3-branched above, very rarely quite simple . . . 74. *Aristida*.

Tribe IX : Zoysiae.—Floret 1 Mature spikelets falling entire and singly, or in clusters. Rhachilla not continued beyond the floret. Involucrel glumes equal or the lower much smaller or suppressed. Floral glume small, delicately membranous, 3-1-nerved, spikelets in slender spiciform panicles or racemes (Genera 75-79)

‡ Spikelets falling in clusters of 2-4, fascicled

§ Fascicles secund on a broad articulate rhachis; glumes 4; upper involucrel glume not echinate . . . 75. *Trachys*.

§§ Fascicles all round a slender rhachis; glumes 3; upper involucrel glume echinate . . . 76. *Nana*.

‡‡ Spikelets falling singly

§ Lower involucrel glume with pectinate margins; upper involucrel glume spinulosely tuberculate, glumes 3 . . . 77. *Latispes*.

§§ Involucrel glumes neither pectinate nor tuberculate

¶ Glumes 2, spikelets not awned . . . 78. *Osterdamia*.

¶¶ Glumes 3, spikelets with a long awn . . . 79. *Perotis*.

♂. Awn of the fertile floret, if present, never kneed and twisted below the knee (Genera 80-105)

* Floral glumes typically 3-nerved (Genera 80-95).

Tribe X: Sporoboleae.—Floret 1. Involucral and floral glumes very similar; rachilla not or rarely produced beyond the floret. Upper floral glumes membranous, acute or obtuse, not changed when ripe, 1- or more or less distinctly 3-nerved, awnless, usually olive-green or grey; side-nerves, if present, delicate, evanescent above. Seed often free in the delicate pericarp. Spikelets small. 80. *Sporobolus*.

Tribe XI: Eragrostae.—Florets usually numerous and far exserted from the glumes. Spikelets variously panicle, sometimes spicate or subspicate, involucrel and floral glumes somewhat similar in general appearance; floral glumes membranous or chartaceous, entire or 2-3-cleft, 3-nerved, the nerve evanescent above or excurrent into bristles; side-nerves usually submarginal, glabrous or pubescent or finely ciliate below, paleae often persistent or sub-persistent (Genera 81-85)

- † Floral glumes entire (Genera 81-84)
- ‡ Upper involucral glume 3-nerved 81. *Eragrostis*.
- ‡‡ Upper involucral glume 5-nerved 82. *Halopyrum*.
- ‡‡‡ Upper involucral glume 1-nerved.
- § Floral glumes ovate subacute or obtuse 83. *Leptochloa*.
- §§ Floral glumes acute or acuminate 84. *Desmostachya*.
- †† Floral glumes toothed 85. *Diplachne*.

Tribe XII: Chlorideae.—Florets 1 to many. Spikelets usually in 2-ranked secund spikes or spike-like racemes, rarely distinctly pedicellate and paniculate, floral glumes usually membranous, truncate, emarginate or toothed, 3-nerved, nerves distant, subparallel, distinct, percurrent or excurrent, and often ciliate all along, the lateral submarginal (in *Eleusine* there are sometimes additional side-nerves close to the middle nerve of the glume). Awn, if present, straight, usually from a truncate or toothed tip (Genera 86-95)

- † Floral glumes entire, emarginate or more or less 2-dentate or 2-lobed, mucicous or with the middle-nerve running out into an awn or mucro, or reduced in some species of *Tripogon* (Genera 86-94)
- ‡ Spikelets 1-flowered (Genera 86-89)
- § Spikes solitary, terminal (see also *Chloris*) (Genera 86-88).
- ¶ Spikelets minute, more or less sunk in the rachis, 1-3-flowered 86. *Oropetium*.
- ¶¶ Spikelets not sunk in the rachis
 - || Spikelets awnless, minute, unilateral on flattened rachis, 1-flowered 87. *Microchloa*.
 - ||| Spikelets awned, 1-2-flowered in deciduous articulate clusters 88. *Gracilea*.
- §§ Spikes digitate 89. *Cynodon*.
- ‡‡ Spikelets with several florets (Genera 90-94).
- § Spikelets with 1 (rarely 2, *Chloris* sp.) fertile and 1 or several imperfect florets above or below the fertile (see also *Microchloa*)
- ¶ Spikelets in long secund solitary spikes, floral glumes narrow, firm, glabrous or scaberulous with a short erect awn from the notched or subentire tips 90. *Enteropogon*.
- ¶¶ Spikelets in digitate, rarely solitary or 2-nate spikes, the florets much widened upwards, or if narrow, then delicate and usually with a fine awn from below the tips, often ciliate, floral glumes or at least some of them awned, very rarely submucicous 91. *Chloris*

- §§ Spikelets with 2 or more fertile florets and without imperfections below them (See also *Chloris* sp), floral glumes awnless or with a rigid mucro or very short awn from the acuminate tips (*Dactyloctenium* sp), entire or subentire (Genera 92-94)
- ¶ Spikelets in digitate or subdigitate spikes
- || Spikes terminated by a spikelet, involucre and floral glumes emucronate or obscurely mucronate 92. *Eleusine*.
- ||| Spikes terminating with a sharp point, upper involucre glume and floral glumes rigidly mucronate or shortly awned 93. *Dactyloctenium*.
- ¶¶ Spikelets in racemously arranged spreading or deflexed, finally deciduous spikes 94. *Dinebra*.
- †† Floral glumes variously toothed or lobed with the middle and side-nerves running out into awns or mucros
 Spikes solitary and terminal on the culms;
 spikelets mostly olive-green or dark greyish,
 all 3 nerves or at least the middle-nerve
 running out into a fine short awn or mucro 95. *Tripsogon*
- ** Floral glumes 5-many-nerved, very rarely 3-nerved (Genera 96-105).
- Tribe XIII: Pappophoreae.**—Floral glumes broad, 5-many-nerved, cleft into 3-many subulate lobes with or without alternating fine straight awns from the anusesa.
 Floral glumes 9-cleft 96. *Enneapogon*.
- Tribe XIV: Oryzeae.**—Spikelets all alike or more or less heteromorphous and unisexual. Fertile floret 1, awned or not, terminal with 2 minute empty florets (floral glumes) below it or solitary. Involucral glumes very minute or confluent into an annular rim or suppressed, palea 3-9-nerved, stamens usually 6, rarely more, or 1-3
- † A floating glabrous grass, spikelets awned 97. *Hygroryza*.
- †† Leafy tall grasses, not floating, spikelets usually awnless
- ‡ Keels of floral glume and palea pectinately ciliate, spikelets awnless 98. *Homalocenchrus*.
- ‡‡ Keels of floral glume and palea not pectinately ciliate, spikelets rarely awned 99. *Oryza*.
- Tribe XV: Festuceae.**—Involucral glumes more or less resembling the floral ones in general appearance. Fruiting florets 2 to many, very rarely 1, often much exserted from the glumes. Floral glumes 5- or more-nerved (rarely 1-3-nerved). Awns, if present, terminal or subterminal, never geniculate
- † Leaves narrow, not tessellately nerved, fruiting glumes without submarginal bristles.
- ‡ Leaves reaching 30 cm long or more, flaccid, inflorescence in long, often interrupted cylindric spikes 100. *Elytrophorus*.
- ‡‡ Leaves less than 5 cm long, rigid, pungent, inflorescence in short subcapitate spikes 101. *Aeluropus*.
- †† Leaves broad, tessellately nerved, fruiting glumes with reflexed submarginal tubercle-based bristles 102. *Centothea*.
- Tribe XVI: Hordeae.**—Spikelets sessile, singly or in clusters, more or less sunk in the hollows of the rachis of a simple spike; florets 1 or more.
- † Spikelets solitary at the nodes of the spike.

- ‡ Spikelets with their median plane radial to the rhachis, florets 1-2, floral glumes membranous to subhyaline, 3-nerved . 103. *Lepturus*.
- ‡‡ Spikelets with their median plane tangential to the rhachis, floral glumes more or less ventricose, keeled upwards, 5-9-nerved . 104. *Triticum*.
- †† Spikelets in groups of 3 at the nodes of a dense spike, floral glumes 5-nerved . 105. *Hordeum*.

2. Blades articulate on the sheath and transversely veined.

Tribe XVII: Bambuseae.—Shrubs or trees, spikelets all of one kind, florets few to many (rarely 1), lower 2 or more glumes empty, gradually increasing in size up to the flowering, with sometimes small terminal imperfect ones; floral glumes subherbaceous to subcoriaceous, 5-many-nerved, usually awnless, lodicules usually 3, stamens 3-6 or more, styles 2 or 3 (Genera 106-110)

- a. Pericarp thin, adnate to the seed.
 - * Paleae all 2-keeled, stamens 6, filaments free . 106. *Bambusa*.
 - ** Paleae of upper flowers 0 or glume-like, not keeled; filaments connate . 107. *Oxytenanthera*.
- b. Pericarp fleshy or crustaceous, not adnate to the seed
 - * Spikelets 2-many-flowered, palea 2-keeled; lodicules none, stamens 6, pericarp crustaceous . 108. *Dendrocalamus*.
 - ** Spikelets many-flowered, paleae 2-keeled; lodicules 3, conspicuous . 109. *Teinostachyum*.
 - *** Spikelets 1-flowered; palea absent or glume-like, stamens 6-120, pericarp fleshy . 110. *Ochlandra*.

THE BOMBAY GRASSES.

SUBFAMILY I: PANICOIDEAE.

The mature spikelets fall entire from their pedicels or with them, all are alike or differ in sex and structure. Perfect spikelets with 2 heteromorphous florets, the upper hermaphrodite, the lower male or barren. Rhachilla not continued beyond the upper floret.

TRIBE I: Mayideae.

Sexes borne on different inflorescences on the same plant or the female spikelets at the base of the inflorescence, and the male above them. The male spikelets in pairs, one sessile, the other pedicelled, or both pedicelled, in spike-like solitary or panicled racemes, 2-flowered. Involucral glumes membranous or chartaceous enclosing the florets. Floral glumes more or less hyaline, awnless. The female spikelets solitary with or without a rudimentary pedicelled companion, 1-flowered. Involucral glumes firm, at least the lower which ultimately often becomes bony, or both thin and more or less hyaline. Floral glumes hyaline, awnless.

See key page xi.

*1 *EUCHLAENA* Schrad.

Stout and tall annuals with leaves very broadly linear or oblong

Male spikelets 2-nate (sessile and pedicellate) on the spiciform fascicled branches of a terminal panicle, 2-flowered with coriaceous glumes. Female spikelets in 2-ranked spikes which are clustered in the leaf-axils, not fused as in the Maize, joints rhomboidal, oblique, articulate, excavate, with the margins of the excavation embracing the cartilaginous outer glume and with it forming a smooth pseudocarp.

Species 2 or 3.¹—Mexico.

*1 *EUCHLAENA MEXICANA* Schrad.

Euchlaena mexicana Schrad Ind. Sem. Hort. Gotting. (1832), reprinted in *Linnaea* 8 (1833)

Litt. 25; H. H. Mann in Bull. 177, Dept. of Agric., Bombay.

Reana luxurians Dur.² in Bull. Soc. Acclim. II, 9 (1872) 581.³

Vernacular name : Teosinte

Etymology : *Euchlaena* comes from the Greek *eu*, well, and *chlaina*, covering.

Description : A large, very succulent, strong growing, annual grass, 30 cm. to 3 m. high. Leaves long, 5-75 cm. broad

Male spikelets 8-9 mm long, crowded in long spikes in a corymb 15-25 cm. long. Female spikes in the leaf-axils. Styles very long, protruding from the top of the enclosing leaf-sheath. The spike of the female spikelets breaking up at maturity into rhomboidal seed-like joints.—Nearly allied to Maize and resembling it in its tassel of male flowers and broad leaves. A single plant often sends up 100 stems. Hybridises with Maize.

Locality : Deccan. Cultivated in the Ganeshkhind Botanic Garden.

Distribution : Mexico.

Economic uses : Cultivated for green fodder, but it does not stand drought well. Horses are fond of it.

*2. *ZEA* Linn

Tall, stout, annual grasses with large leaves, the axils of the lower of which produce the cobs, tightly enveloped by large membranous bracts.

Sexes in different inflorescences on the same plant, male spikelets in large terminal panicles made up of racemously arranged or subdigitate spike-like racemes; female spikelets in axillary sheathed "cobs", consisting of several spikes whose axes are fused into a spongy more or less

¹ For a review and history of the species of *Euchlaena* Schrad, see G. N. Collins in Journ. Hered. 12 (1922) 539, and S. S. Hitchcock, A perennial species of Teosinte, in Journ. Washington Acad. Sciences 12 (1922) 205-207

² Durieu in mentioning 'Teosinte' thinks that it is probably the name of a country

³ The name is not technically published as there is no description.

cylindrical body. Male spikelets 2-nate, one sessile, the other alternate on the articulated rachis of the spike-like racemes, 2-flowered, awnless; involucre glumes subequal, membranous, convex, obscurely 2-keeled, 9-10-nerved, florets alike; floral glumes more or less hyaline, 3-5-nerved, paleae similar, 2-nerved, obscurely keeled; lodicules 2, fleshy, stamens 3; anthers linear. Female spikelets 2-nate in 4-11 longitudinal rows, slightly immersed in the spongy axis of the cob, with a lower barren and an upper fertile floret, awnless; involucre glumes similar, very broad, fleshy below, hyaline above, nerveless, ciliate, lower floral glume resembling the involucre glumes but shorter and eciliate, with or without a similar but smaller palea, upper floral glume similar to the lower with a palea about as long as the ovary, lodicules 0; ovary obliquely ovoid, style very long, 2-fid at the tip, papillose upwards, exerted in long silky tassels from the sheathing bracts. Grain large, subglobose or dorsally more or less flattened, surrounded by the dried up involucre glumes, floral glumes and paleae; scutellum large, equalling or exceeding two-thirds of the grain.

Species 1.—A native of America, in cultivation in all warm countries of the globe.

*1. *ZEa* MAYS LINN.

Zea Mays Linn. Sp. Pl. (1753) 971; P. Beauv. Agrost. (1812) t. 24, fig. 3; Kunth Enum. Pl. I (1833) 19, Doell in Mart. Fl. Bras. II, II, 31, t. 11, Benth. & Trim. Medic. Pl. t. 296; Duthie Field & Gard. Crops. 25, t. 5, Koern. & Wern. Handb. d. Getreideb. I (1886) 330-378, II (1885) 772-870; Harshberger Maize in Contr. Lab. Univ. Pennsylv. I (1893) 75-202, Montgomery Corn Crops (1913) 1-275; Davy Maize (1914); Stapf in Fl. Trop. Afr. IX (1917) 26.

Mays zea Gaertn. Fruct. I (1788) 6, pl. 1.

Vernacular names: Maize, Indian Corn, Makai, Boota, Macka, Bari Joar, Bonda, Goinjol, Mekhejol.

Etymology: *Zea* is the old Greek name for a cereal mentioned by Homer.

Description: Culms up to 3 m. high, sometimes more. Leaf-sheaths terete, more or less hairy upwards along the margin, ligule short, truncate, thinly membranous, more or less pubescent, blades linear-lanceolate, up to over 90 cm. long and 10 cm. wide, glabrous or almost so, tips often drooping.

Male panicle up to over 20 cm. long; rachis pubescent, spikelets up to 12 mm. long; anthers 6 mm. long. Female spike (cob) and grains varying much in size and shape, the grains also in colour.

Locality: Chiefly cultivated in the Panch Mahals either as a rains or as a late irrigated crop. A good deal is grown in Satara, Sholapur and Belgaum. In the Deccan it is mostly grown for early fodder, though the grain is allowed to ripen and the ears are readily sold in towns for roasting.—Area in 1922-23, 208,914 acres.

Ecology: Where rainfall is sufficient Maize does best on the rich brown soils of the Panch Mahals. Also Rice land by retention of moisture either by position or by depth and density, suits the crop. As its quick habit of growth does not make it a good companion for subordinate mixtures, it is usually sown alone. It grows rapidly and requires little water considering the yield of fodder which it gives. It is very likely the best emergency fodder crop to grow when the rain fails and when famine is imminent.

Distribution: Maize seems to be a native of New Granada, but is now cultivated almost throughout the world. There is scarcely a doubt that Maize came to India from America. It was possibly brought thence direct by the Portuguese, just about the time when the East India Company arrived in India.

Origin. The origin of Maize is a much discussed question. Some are of opinion that it has been developed from Teosinte (*Euchlaena*), others that the original wild form has become extinct. A more acceptable opinion is that it is a hybrid between Teosinte and an unknown or extinct species resembling pod-corn, a variety of *Zea Mays* in which each kernel is enveloped in the elongated floral bracts.¹

Knuwada² who studied the number of chromosomes in Maize came to the conclusion that *Zea Mays* was originally derived from the hybridization between *Euchlaena* and some unknown species of the tribe *Andropogoneae*, long chromosomes belonging to the former and short ones to the latter, and that the nuclei of its various individuals possess both kinds of chromosomes in various combinations according to the law of chance.

¹ Collins, The Origin of Maize. Journal Wash. Acad. Sci. 2 (1912) 520.

² Knuwada, Y., Die Chromosomenzahl von *Zea Mays* L. Ein Beitrag zur Hypothese der Individualität der Chromosomen und zur Frage über die Herkunft von *Zea Mays* L. Jour. Coll. Sci. Imperial Univ., Tokyo, 39 (1919) 1-148.

To explain the structure of the ear of Maize Collins published evidence which indicated that the ear may have developed through the twisting of yoked pairs of spikelets Weatherwax¹ tries to refute this opinion. He contends that dropping of rows of seeds is due to the discontinuance of a row of paired spikelets and not to the loss of the pedicelled spikelets from yoked pairs, and that there is no indication that short rows represent long rows partially aborted, but that the abortion of spikelets or of rows in the ear seems to be much more constant as a characteristic of theories than of real ears.

Genetics : Those interested in Maize from a genetic point of view are referred to the more recent publications mentioned in the footnote ²

Economic uses : See Watt, Dict. Econ. Prod. VI, pt. IV, 326 and Commercial Prod. of India (1908) 1132, and various authors mentioned above.

Many experiments have been made in America to see if prussic acid, the poison of young jowar fodder, is to be found in Maize. It has never been detected in Maize, not even in suckers from Maize stalks in the field See also M. H. Keith, A bibliography of investigations bearing on the composition and nutritive value of corn and corn products Washington, 1920.

Medicinal uses : See Dymock, Pharmacogr. Ind. III (1893) 579, and Bentley and Trimen, Medicinal plants.

Diseases : For a good account of the fungi attacking Maize see E. J. Butler, Fungi and disease in plants (1918) 191-202.

The Moth-borer of the Sugar-cane, Maize and Sorghum is discussed in Mem. Dept. Agric. Ind. I (1907) No. 2.

3. COIX Linn.

Tall leafy monoecious annual or perennial grasses, stem branching, spongy within. Leaves long, flat, broad.

Racemes many, axillary and terminal, lower spikelets solitary, female, enclosed in an ultimately hardened, polished, nut-like bract, through the apex of which the male portion of the spike protrudes. Male spikelets 2-3-nate at each node of the rachis, 1 sessile and 1 or 2 pedicellate, lanceolate. Glumes 4, involucrel glumes subequal, empty, rigid or herbaceous; lower involucrel glume winged along the inflexed margin; upper involucrel glume not winged; floral glumes hyaline, paleate, triandrous or empty. Female spikelets ovoid, acuminate. Glumes 4; lower involucrel glume chartaceous, the other 3 glumes becoming successively thinner, upper floral glume paleate. Lodicules 0. Stamens minute. Ovary ovoid; styles 2, free, slender. Grain orbicular, ventrally furrowed, enclosed in the hardened globose ovoid or cylindric involucre.

Species 5 or 6—Hot countries of the Old World; only 1 in the Bombay Presidency

1. COIX LACHRYMA-JOBI Linn.

PLATE 1.

Coix Lachryma-Jobi Linn. Sp. Pl. (1753) 972, Hook. f. Fl. Brit. Ind. VII (1896) 100, Cooke Fl. Bomb. II (1908) 997.

C. Lachryma Linn. Syst. ed. X (1759) 1261, Beauv. Agrost. (1812) 137, t. 24, fig. 5; Roxb. Fl. Ind. III (1832) 568, Grah. Cat. Bomb. Pl. (1839) 240; Dalz. & Gals. Bomb. Fl. (1861)

¹ Weatherwax, P., A misconception as to the structure of the ear of Maize. Bull. Torrey Bot. Club, 47 (1920) 359-362.

² Blaringhem, L., Production par traumatisme d'une forme nouvelle de Maïs à caryopses multiples, *Zea Mays* var. *Polysperma*. Compt. Rend. Acad. Sci. Paris 170 (1920) 677-679.

Collins, G. N., Structure of the Maize ear as indicated in *Zea-Euchlaena* hybrids. Jour. Agr. Res., 17 (1919) 127-135.

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Emerson, R. A., The nature of bud variations as indicated by their mode of inheritance. Amer. Nat., 56 (1922) 64-79.

Hume, A. N., A system for breeding corn or gregarious animals. Jour. Heredity, 11 (1920) 677-679.

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Jones, D. F., The effect of inbreeding and crossbreeding upon development. Proc. Nation. Acad. Sci. 4 (1918) 246-250.

Jones, D. F., Heritable characters of Maize. Jour. Heredity 11 (1920) 111-115.

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289, Duthie Grasses N. W. Ind (1883), Fodder Grasses N. Ind. (1888) 18; Hack. in Bolet. Soc. Brot V, 212.

C. agrestis Lour Fl Cochinch (1790) 551.

C. arundinacea Lam. Encycl. III, 422.

C. ovata Stokes Bot Mat. Med IV (1812) 342

C. pendula Salisb Prodr (1796) 28

C. puellarum Balans in Journ de Bot IV (Paris, 1890) 77.

C. stigmatosa Kock. & Bouché Ind. Sem. Hort. Berol (1855) 9.

Lithagrostis Lacryma Jobi Gaertn Fruct I (1788) 7, t. I, fig. 10.

Vernacular names : Job's Tears, Christ's Tears, Ran-jondhla, Ranmaka, Kassar, Kardha, Gurgur, Keruch, Kassaibij (fruit)

Etymology : *Cox* is a name used by Theophrastus and Plinius for an Egyptian palm the leaves of which were used for mats and baskets. The name *Lachryma Jobi* means Job's Tear and comes from the fancied resemblance of the fruit to tears.

Description : Stem 90-150 cm high or more, stout, rooting at the lower nodes; internodes smooth, polished. Leaves 10-45 by 2.5-5 cm, narrowed from a broad cordate base to an acuminate tip, smooth on both surfaces, with slender nerves and spinulose serrate margins; midrib stout; sheaths long, smooth, ligule a very narrow membrane.

Racemes 2.5-6.3 cm. long, nodding or drooping from long peduncles, rachis within the bract slender, above the bract stout, notched at the nodes. Male spikelets 1-1.3 cm long, subsecund, imbricating. Lower involucre glume 1 cm. long, elliptic-lanceolate, acute, concave, many-nerved, with inflexed margins and with a narrow wing arising from a little above the edge of the margin with many branched green veins; upper involucre glume similar to the lower but not winged, 5-9-nerved; lower floral glume oblong-lanceolate, hyaline, paleate, triandrous, faintly 3-5-nerved; upper floral glume similar, paleate, triandrous or empty. Anthers 5 mm. long, orange. Fruit from broadly ovoid to globose, bluish grey, 6-10 mm. long, smooth, polished.

Locality : Sind - Umarmkot, sandy plains (Sabnis B 717 !); Chuar Chemali, Indus River (Blatter & McCann D680 !); Mirpur Sakro (Blatter & McCann D681 ! D683 !); Ghara (Blatter & McCann D682 !).

Gujarat (Graham).

Khandesh (McCann !)

Konkan - Gokhiwara, Bassein (Ryan 25), Done Forests (Ryan 713 !); Junga Hill, Thana (Paranjpye !), Alibag, ricefields (Ezekiel !); Kanari Caves, foot (McCann 9876 !); Sion (McCann 8453 !); Bhandup, near tank (McCann 5098 !); Horse-shoe Valley, Ghatkopar (McCann 9877 !); common along line from Kalyan to Kasara in streams (McCann !).

W. Ghats - Igatpuri (McCann 4346 !); Matheran (Paranjpye !); Lonavla (Garade !, McCann !, Woodrow), Khandala, common all over (McCann 9405 !); Panchgani Ghat (Cooke), Panchgani (Blatter !).

Deccan - Purandhar (McCann 5005 !)

S. M. Country : Devarayi (Sedgwick & Bell 4426 !); Dharwar (Sedgwick 1856 !).

N. Kanara (McCann !)

Ecology : Gregarious, forming pure associations, very abundant in standing water. Common all through the Konkan and Deccan, filling up the banks of streams and fields.

Distribution : Tropical Asia, cultivated in Africa and America.

Economic uses : Used as fodder for cattle. Duthie says that they fatten on it. Haines calls it a poor fodder for cattle. Of the false fruits there are several varieties differing much in size, shape and colour, and used for decorative purposes in place of beads. According to Stapf one variety with thin shells is an important cereal in Burma and in the Farther East. Waxy endosperm, first found in Maize from China, Burma and the Philippines has been found now in *Cox Lachryma-Jobi* from the same region.¹

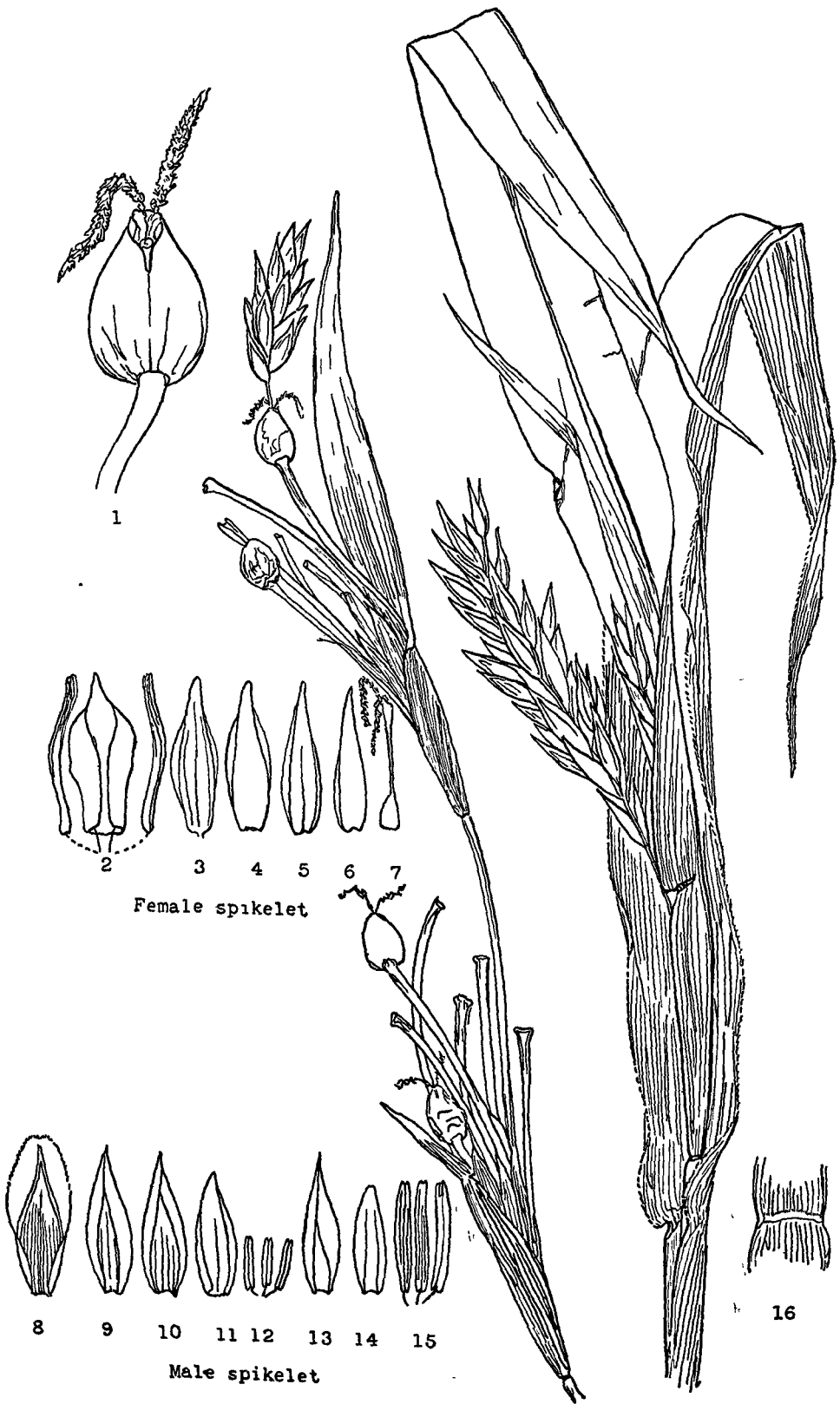
Medicinal uses : See Dymnock, 573.

Explanation of Plate 1 : *Cox Lachryma-Jobi* Linn.

1. Female spikelet showing nut-like bract.
2. Lower invol. glume.
3. Upper invol glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea
7. Grain and styles

} Female spikelet.

¹ Keimpton, J. H., Waxy endosperm in *Cox* and *Sorghum*. Journ. Heredity, 12 (1921) 398-400.

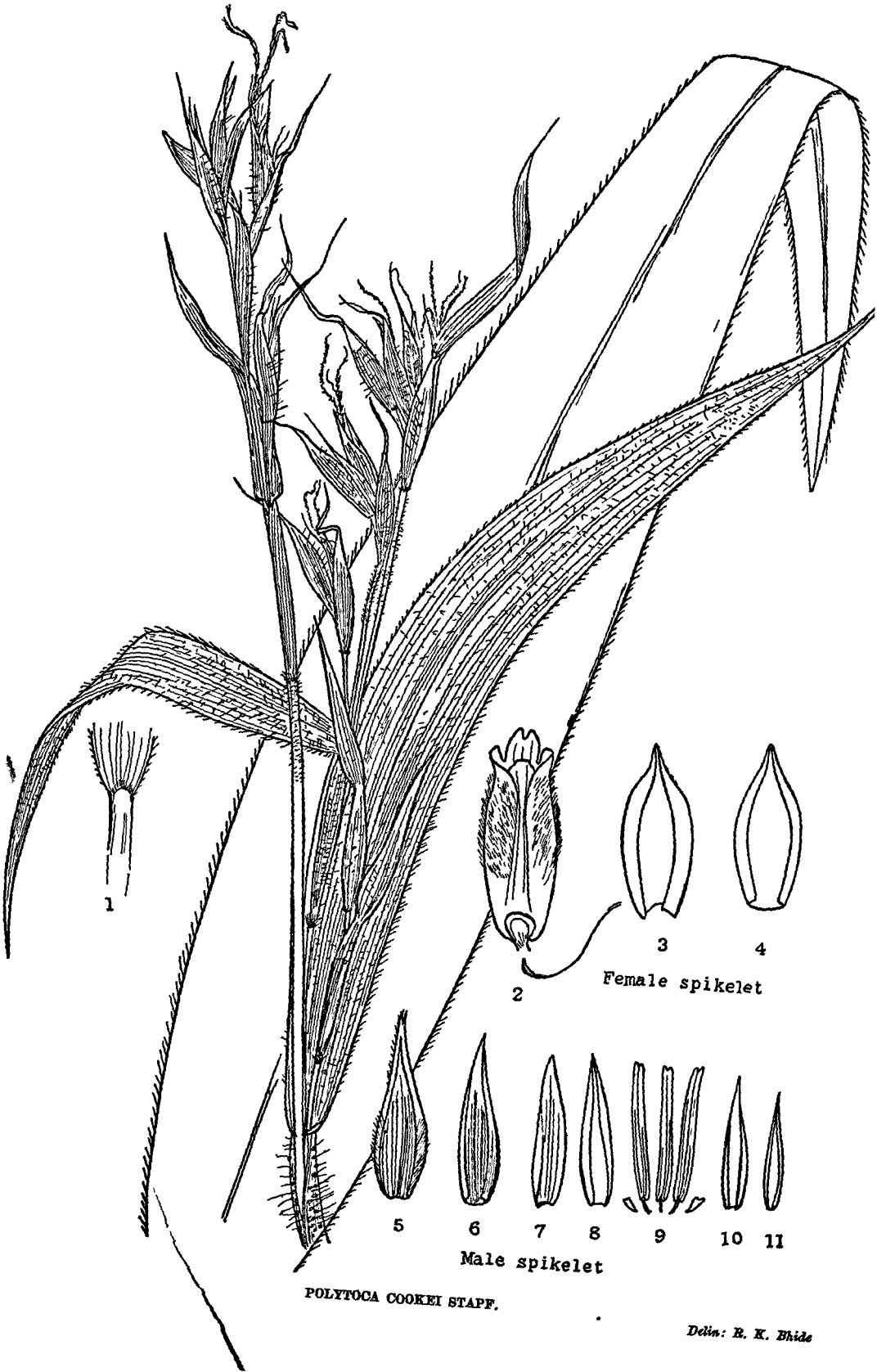


Female spikelet

Male spikelet

COIX LACHRYMA-JOBI LINN.

Dehn · R K Bhide.



POLYTOCA COOKEI STAPF.

Drawn: R. K. Bhida

- | | | |
|---------------------------------|---|----------------|
| 8. Lower invol glume | } | Male spikelet. |
| 9. Upper invol. glume | | |
| 10. Lower floral glume. | | |
| 11. Palea of lower floral glume | | |
| 12. Stamens. | | |
| 13. Upper floral glume. | | |
| 14. Palea of upper floral glume | | |
| 15. Stamens. | | |
| 16. Ligule. | | |

4. POLYTOCA R. Br.

Tall stout erect branching annual or perennial leafy monoecious grasses; stem spongy within; nodes bearded; flowering branches fascicled. Leaves long, flat

Inflorescence of spike-like racemes, terminating the branches, at first enclosed in spathiform bracts; racemes all male or with one or more female spikelets at the base. Male spikelets 2-flowered, sometimes imperfect. Glumes 4 (with sometimes a terminal rudimentary one), all subequal in length; involucrel glumes empty, lower involucrel glume herbaceous, shallowly concave, many-nerved, with a narrow membranous margin, upper involucrel glume narrower, ovate, acuminate, 5-9-nerved; lower floral glume membranous, oblong, acuminate, 3-5-nerved, paleate, trandrour; upper floral glume very slender, linear, hyaline, paleate, trandrour or empty. Lodicules 2, cuneate. Anthers long. Female spikelets broadly oblong, 1-flowered; lower involucrel glume thickly coriaceous, closely embracing the rachis of the spike by its involute margins, with many obscure nerves, the other 3 glumes enclosed in the lower involucrel glume, hyaline; upper involucrel glume oblong, many-nerved, lower floral glume narrower, oblong, 3-5-nerved, empty; upper floral glume very narrow, truncate, 3-nerved, paleate. Styles very long, stigmas slender. Grain small, fusiform, terete, enclosed in the nut-like polished hardened glume.

Species 8.—Tropical Asia, Australia.

1. Leaves 45-60 by 5-7.5 cm.; lower involucrel glume of female spikelet 3-lobed at the tip 1. *P. Cookei*.
2. Leaves 15-30 by 0.6-2.2 cm.; lower involucrel glume of female spikelet entire at the tip 2. *P. barbata*.

1. POLYTOCA COOKEI Stapf.

PLATE 2

Polytoca Cookei Stapf in Hook. Ic. Pl. 24 (1895) t. 2333, Hook. f. Fl. Brit. Ind. VII (1896) 101; Cooke Fl. Bomb II (1908) 998

Vernacular name: Kurisal.

Etymology: *Polytoca* is derived from the Greek *polys*, many and *tokas*, bringing forth.—The specific name refers to Th. Cooke, the author of the Bombay Flora.

Description: Annual; stem 90 cm (or more) high, smooth; nodes bearded. Leaves 45-60 by 5-7.5 cm., linear-lanceolate, acuminate, more or less hispid on both sides with bulbous-based hairs, and with thickened and ciliate margins; sheaths rather loose, striate, hairy with bulbous-based hairs; ligule short, subhyaline, hairy with yellowish hairs.

Flowering branches fasciculately crowded in the axils of the upper leaves, each with a linear acuminate pubescent bract at the base. Male panicles reaching 7.5 cm. long. Male spikelets 8 mm long, geminate, one longer than the other, shortly pedicellate or sessile. Glumes 4; lower involucrel glume lanceolate, acuminate, pubescent, many-nerved, with a hyaline more or less inflexed margin; upper involucrel glume slightly shorter and thinner than the lower one, with slender nerves. Floral glumes slightly shorter than the lower involucrel glume, glabrous, few-nerved, hyaline. Anthers 3, linear. Female spikelets 8 mm. long; lower involucrel glume crustaceous, oblong, the margins connate at the base, closely embracing the upper involucrel glume, the apex with a 3-lobed crest the lateral lobes of which are obliquely truncate, the midlobe emarginate, upper involucrel glume slightly shorter than the lower, oblong, acuminate; lower floral glume about equalling the upper involucrel glume, oblong, suddenly apiculate, 13-15-nerved; upper floral glume shorter than the lower, hyaline, nerveless, sometimes 2-fid.

Locality : *Kathawar* : Junagad (Blatter !).

Konkan : Tungar forest, Bassein (Bhide !); Bombay (Dalzell); Salsette (Jaquemont 706).

W. Ghats : Igatpuri (McCann 9880 !); Khandala (McCann 9881 !); Mahableshwar (Woodrow, Cooke); near Mahableshwar (Woodrow !)

N. Kanara (Lisboa)

Ecology : Growing sporadic.

Distribution : Apparently endemic in the Presidency.

Economic uses : Rosaries are made of the stony fruits.

Explanation of Plate 2 : *Polytoca Cookei* Stapf.

- | | |
|--|--------------------|
| 1. Ligule. | } Female spikelet. |
| 2. Lower and upper invol. glumes. | |
| 3. Lower floral glume. | |
| 4. Upper floral glume. | |
| 5. Lower invol. glume (tip not correct, should be acuminate according to the description). | |
| 6. Upper invol. glume. | } Male spikelet. |
| 7. Lower floral glume. | |
| 8. Palea of lower floral glume. | |
| 9. Stamens and lodicules. | |
| 10. Upper floral glume. | |
| 11. Palea of upper floral glume. | |

2. POLYTOCA BARBATA Stapf.

PLATE 3.

Polytoca barbata Stapf in Hook. f. Fl. Brit Ind. VII (1896) 102; Cooke Fl. Bomb. II (1908) 999; Lisboa Bomb. Grasses (1896) 42.

Coxa arundinacea Koen. ex Willd. Sp. Pl. IV, 203 (*non* Lam.).

C. barbata Roxb. Fl. Ind. III (1832) 569; Dalz. & Gibs. Bomb. Fl. (1861) 289.

C. gigantea Herb. Russ. ex Wall. 8626.

C. Koenigii Spreng. Syst. I, 228

Chromachne barbata R. Br. in Benn. Pl. Rar. Jav. 18; Duthie Grasses N. W. Ind. (1883) 11; Fodder Grasses N. Ind. (1888) 19.

Vernacular names : Kanta-karvel, Vanval, Kawdia, Karang, Gurgur.

Etymology : *Barbata* means bearded.

Description : Stem 90-180 cm. high, as thick as the little finger below, terete, smooth; nodes softly bearded. Leaves 15-20 by 0.6-2.2 cm., linear, acuminate, scabrid above, with a stout midrib and scabrid margins; sheaths long, smooth, glabrous or hairy; ligule a narrow ridge.

Racemes paniculate, on slender peduncles; spathuliform sheaths 2.5 cm. long (or more), with a long awn at the tip; proper sheaths 13 mm. long, oblong, awned; male portion of the raceme appearing as if sessile on the top of the female spikelet, articulate with the internode below it which is embraced by the margins of the outer glume of the female spikelet; rachis hardly articulate between the male spikelets. Male spikelets reaching 1 cm. long. Lower involucre glume 8 by 4 mm., ovate, acute, concave, pubescent. Female spikelets 4 mm. long, glabrous. Glumes 4, lower involucre glume thickly coriaceous, white, shining, closely wrapped round the rachis of the spike and the other glumes, obscurely many-nerved; tip entire.

This grass often reaches 2.7 m. The internodes are smooth and polished. The sheaths and leaves, particularly the former, are armed with long stiff brittle irritant hairs. With maturity the hairs are shed and are frequently completely lost in herbarium material.—The anthers when fresh are brick red. The inflorescence deteriorates in the herbarium leaving numerous spikelets.

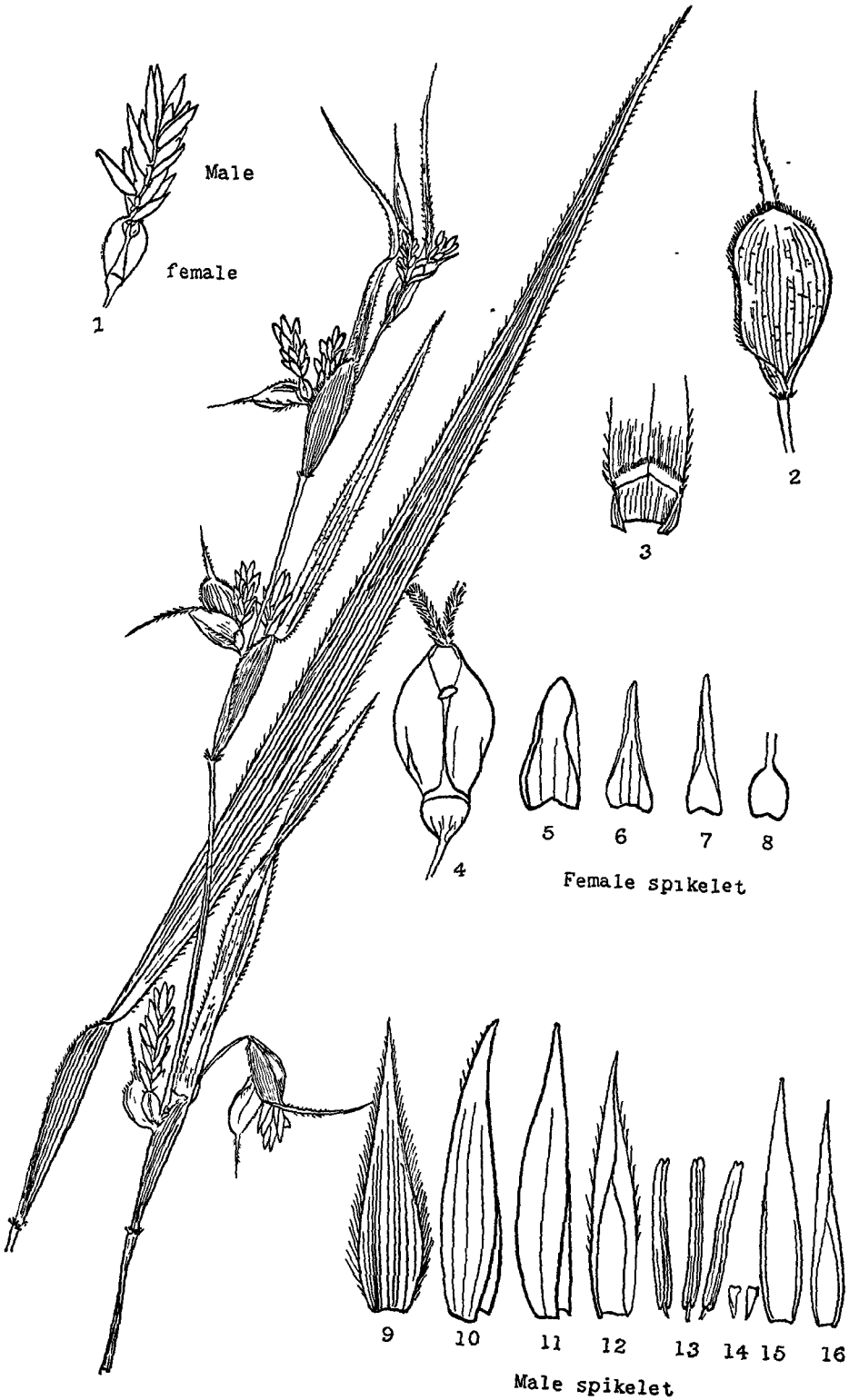
Locality : *Kathawar* : Junagad (Blatter 3784 !).

Gujarat : Charodi farm (Gamme 16536 !); Nadiad farm (Herb. Econ. Bot. Poona !); Surat (Sedgwick !).

Khandesh : Toranmal (McCann 9883 !); Taloda (Golne !).

Konkan : Bombay, between Worli Fort and Hornby-Villard Rd., on bank (Sabnis 9884 !); Thana (McCann !).

W. Ghats : Fitzgerald Ghat (McCann 3599 !).



POLYTOCHA BARBATA STAPF

Delin. B. K. Bhida.

Deccan : Poona Dist., high hills round Junnar (Dalzell & Gibson); Poona (Woodrow); College of Science, Poona (Herb. Econ. Bot. Poona !); Ganeshkhind Bot. Gard. (Herb. Econ. Bot. Poona !); Haveli (Herb. Econ. Bot. Poona !); near Sholapur (Woodrow !).

S. M. Country S.-W. of Dharwar (Sedgwick & Bell 4433 !); Kunemehalli (Sedgwick 1947 !), Kolhapur (Woodrow !, Herb. Econ. Bot. Poona !).

N. Kanara Gersoppa Falls (Talbot !).

Ecology : Sporadic, only found as isolated plants. Common on wet ground. Purely a monsoon species. The lowest nodes of the stem send out stout stiff roots on all sides at an angle of about 45°. The tip of the root when young and before it reaches the ground is enveloped for about 6 mm. or more with a mucilaginous transparent globule till it reaches the soil.—The male inflorescence appears at the terminal end of the culms and branches much in advance of the female flowers.—A most troublesome plant to press or to go through in the jungle on account of the hairs.—Commonly growing in the shade of trees in deciduous forest on hillsides where water does not remain.—Begins to flower in late September, the male inflorescence appearing first and the female in the first week of October.

Distribution : India, Ceylon, Java.

Economic uses : Said to be used as fodder at Balaghat. The stony fruits used for rosaries.

Explanation of Plate 3 : *Polytoca barbata* Stapf.

- | | |
|----------------------------------|--|
| 1. Male and female spikelets. | |
| 2. Spathe. | |
| 3. Ligule | |
| 4. Female spikelet | |
| 5. Lower floral glume. | |
| 6. Upper floral glume. | |
| 7. Palea. | |
| 8. Grain. | |
| 9. Lower invol. glume. | |
| 10. Upper invol. glume. | |
| 11. Lower floral glume | |
| 12. Palea of lower floral glume. | |
| 13. Stamens. | |
| 14. Lodicules. | |
| 15. Upper floral glume. | |
| 16. Palea of upper floral glume. | |
- } Female spikelet.

 } Male spikelet.

TRIBE II: Andropogoneae.

Spikelets usually in pairs, one sessile the other pedicelled, very rarely both pedicelled, those of each pair usually alike as to sex (homogamous) or different (heterogamous) on the axes of variously arranged, often spike-like racemes. Involucral glumes more or less rigid and firmer than the floral glumes, and the lower always longer than the florets. Floral glumes membranous, often hyaline, that of the upper floret awned or reduced to an awn or mucous.

See key page xi.

5. DIMERIA R. BR.

Erect slender, annual or perennial grasses. Leaves narrow.

Inflorescence of solitary or 2-nate or digitate slender racemes bearing many spikelets; rachis of racemes articulate, terete, angular or flattened. Spikelets 1-flowered, articulate, subsessile or on very short pedicels, laterally much compressed, solitary, secund, bifarious, 2-sexual. Glumes 4; involucral glumes usually divaricate in flower, empty; lower involucral glume coriaceous, linear, with complicate sides, dorsally rounded; upper involucral glume as long as or longer than the lower one, chartaceous, oblong, with hyaline margins and complicate sides, dorsally keeled, the keel sometimes winged; lower floral glume shorter than the upper involucral glume, linear or oblanceolate, empty, epaleate; upper floral glume hyaline, complicate, oblong, 2-fid, awned in the sinus, the awn capillary with a short column, palea minute or 0. Lodicules 0 or very minute. Stamens 2; anthers long or short. Styles short; stigmas short, laterally exserted. Grain linear, compressed.

Species 18.—Indo-Malaya, S. China.

1. Spikelets in 2-3-nate racemes. Annuals.

- a. Rhachis nearly straight. Awn long . . . 1. *D. ornithopoda*.
 b. Rhachis circinate-curved. Awn short . . . 2. *D. Woodrowii*

2. Spikelets in many-nate racemes. Perennial . . . 3. *D. gracilis*.3. Spikelets in panicles. Annual . . . 4. *D. diandra*.

The species of this genus usually inhabit open, flat, dry, gravelly plains which are well drained during the monsoon, and several species may be found associated with each other in the same locality to the exclusion of every other plant. Where *D. ornithopoda*, *gracilis* and *diandra* grow together, the 2 former are more numerous.

1. DIMERIA ORNITHOPODA Trin

PLATE 4.

Dimeria ornithopoda Trin. Fund. Agrost. (1820) 167, t. 14; Hack. Monogr Androp. (1889) 81; Hook f. Fl. Brit. Ind. VII (1896) 104, Cooke Fl. Bomb. II (1908) 945.

D. filiformis Hochst. in Hohenack. Pl. Ind. Or. n. 231.

D. styraeiformis Miq. Prolus. Fl. Jap 176

Andropogon filiformis Roxb. Fl. Ind. I (1832) 256.

A. Roxburghianus Schult. Mant. II, 451.

Peristachys filiformis Dalz. & Gibs. Bomb. Fl. (1861) 305

Vernacular name : Kap-kurdi.

Etymology : *Dimeria* means having two parts, very likely in allusion to the bifarious arrangement of the spikelets—*Ornithopoda* means "bird-footed".

Description : A slender annual tufted leafy grass 15-50 cm. high. Leaves 2.5-7.5 cm. by 2.5-3 mm, erect, linear, finely acuminate, sheaths usually glabrous.

Racemes 2 (rarely 3), very slender, 2.5-5 cm long; rhachis flexuous, stout, angular. Spikelets about 2.5 mm long, sessile or subsessile, linear, acuminate; callus villous with short white hairs. Glumes 4, lower involucreal glume slender, linear, acute, 2.5 mm. long, slightly pubescent or nearly glabrous; upper involucreal glume slightly longer than the lower one, linear, acuminate, with hyaline margins, pubescent on the back; lower floral glume 2 mm. long, linear, acute, upper floral glume 1.5 mm long, hyaline; awn nearly 8 mm. long, the column 3 mm. long, brown, the upper part white, capillary.

Locality : *Konkan*. Vetora (Sabnis 33715'), Kankeshwar Hills, Alibag (Bhide!); Marmagao (Talbot!)

W. Ghats Khandala, Tata's Lake, very common (McCann A309! 9885!, Woodrow), Lonavla, Sakhar-Pathar (Gammie 15948!), Lonavla (Bhide!, Lisboa); Mahableshwar (Dalzell & Gibson, Lisboa), Lungmala to Mahableshwar, 4,000 ft., rainfall 200 in. (Sedgwick & Bell 4653!), Panchgani (Blatter & Hallberg B1214! B1219! B1279! B1289!, Woodrow); Castle Rock (Bhide!), Londa (Woodrow!).

N. Kanara Yellapur (Sedgwick 3124!), Birchy (Talbot 2251!); Karwar (Hallberg & McCann A307!), Siddhapur to Sursi, open grass-land (Hallberg & McCann A313!); Jagalbet (Talbot 1565).

Ecology : This species is subgregarious, *ve*, forming patches of many individuals or combining with other individuals to form associations of few species.

Distribution : All over India, Malay Islands, Japan, tropical Australia.

Explanation of Plate 4 : *Dimeria ornithopoda* Trin.

1. Rhachilla with 2 spikelets.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Upper floral glume.
7. Stamens and styles.
8. Ligule.

2. DIMERIA WOODROWII Stapf.

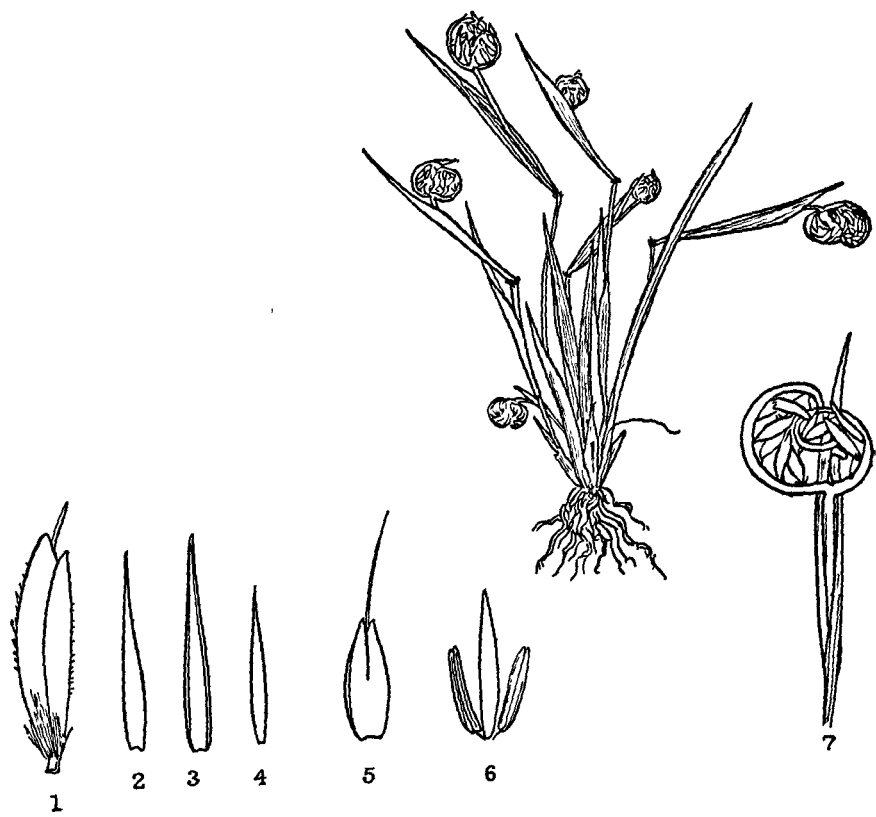
PLATE 5.

Dimeria Woodrowii Stapf in Hook. Ic. Pl. 24 (1895) t. 2312; Hook. f. Fl. Brit. Ind. VII (1896) 104; Cooke Fl. Bomb. II (1908) 945; Lisboa Bomb. Grasses (1896) 44.



DIMERIA ORNITHOPODA TRIN.

Delin: R. K. Bhada



DIMERIA WOODROWII STAFF.

Description : Annual, 7-6-15 cm. high ; stem slender, leafy, more or less branched ; nodes pubescent ; upper internode (or peduncle) with its leaf abruptly deflexed after flowering. Leaves 3-8-7-5 cm by 1 5-2 5 mm , linear, finely acuminate, 3-nerved, with a strong midnerve, glabrous or nearly so , sheaths glabrous ; ligule very short, hyaline

Racemes 2-2 5 cm. long, geminate, at first erect, then circumately incurved, glabrous ; rhachis trigonous, subundulate , internodes shorter than the spikelets , pedicels distinct, about 0 6 mm long Spikelets 4 mm long, sublinear, few, rather distant, suberect, diverging as the rhachis incurves, callus bearded. Glumes 4 , lower involucrel glume rather more than 3 mm. long, linear, acute, folded, 1-nerved, glabrous or sparsely hairy ; upper involucrel glume slightly longer than the lower one, broader, acute, narrowly keeled and thickened at the back, the margins hyaline , lower floral glume narrowly linear, hyaline, sometimes mucronulate , upper floral glume rather more than 2 5 mm. long, 2-fid, awned at the sinus, hyaline, the awn about 3 mm. long Grain linear-lanceolate, compressed.

Locality : *Konkan* Ratnagiri (Herb. Dhura¹, Woodrow) ; Karanjee, Ratnagiri Dist. (Herb Econ Bot Poona¹) ; Marmagao (McCann¹, Bhide¹, Talbot 2557)

N. Kanara Mirjan (Hallberg & McCann¹) , Honavar, open rocks (McCann¹).

Ecology : Usually growing in open rocky situations.

Distribution : W Peninsula.

Explanation of Plate 5 : *Dimeria Woodrowii* Stapf.

1. Spikelet
2. Lower invol glume
3. Upper invol glume
4. Lower floral glume.
- 5 Upper floral glume.
6. Grain and stamens
7. Inflorescence

3. DIMERIA GRACILIS Nees.

Dimeria gracilis Nees ex Steud. Syn Pl Glum (1855) 413 ; Hack Monogr. Androp (1889) 88 ; Hook f. Fl. Brit. Ind VII (1896) 105 , Lisboa Bomb Grasses (1896) 45 ; Cooke Fl. Bomb II (1908) 946.

Etymology : *Gracilis* means slender.

Description : Perennial ; stems densely tufted, 30-90 cm. high, leafy, stout or slender, rarely branched Leaves 15-25 cm. by 3-4 mm., erect, rigid, narrowly linear, finely acuminate, glabrous or pilose, base narrowed into the sheath , sheaths terete, not auricled at the mouth ; ligule short, broad, membranous, ciliate.

Racemes 3-10, very slender, 7 5-12-5 cm. long, pale brown, lax-flowered, flexuous ; rhachis filiform, obtusely trigonous or subterete, glabrous Spikelets 4-6 mm. long , pedicels long or short ; callus very short ; densely bearded Glumes 4 ; lower involucrel glume 4 mm. long, linear, acute, plicate, more or less scaberulous ; upper involucrel glume 5 mm. long, linear, acute, aristate, with hyaline ciliate margins ; lower floral glume obovate-oblong, ciliate above the middle ; upper floral glume 2 5 mm. long, linear-oblong, acutely 2-fid, awn 1 cm. long (or more), the lower third brown, the upper two-thirds white ; palea minute, narrow, ciliate. Lodicules large, broadly cuneate.

Locality : *Konkan* · Pen, hills (Bhide¹) ; Vetora (Sabnis 3714¹).

W. Ghats · Khandala (McCann A318¹) ; Lonavla (Bhide¹, Woodrow) ; on the Ghats (Lisboa¹) ; Castle Rock (Bhide¹) ; Anmod to Castle Rock (Sedgwick 3254¹).

N. Kanara (Sedgwick & Bell 3165¹) ; Supa (Sedgwick & Bell 4880¹) ; Arbail Ghat (Sedgwick & Bell 5018¹) ; Sursi (Gammie¹) ; Kumwada (Talbot 2260¹) ; Yellapur (Talbot 1527¹) ; Kadra (Talbot¹), Sampkhand (Hallberg & McCann A308¹), Sursi to Siddhapur (Hallberg & McCann A311¹) ; Devmane (Talbot¹).

Ecology : Where this species is growing together with other species of *Dimeria* it can easily be recognized by its over-towering the others This species was found growing among other grasses, especially by the side of *Arthraxon serrulatus* Hochst , it has a peculiar withered look on account of the light brown or yellowish white colour of the inflorescence.

Distribution : W. Peninsula, Ceylon.

4. DIMERIA DIANDRA Stapf.

Dimeria diandra Stapf ex Bhide in Journ. & Proceed. Asiat. Soc. Bengal (new series) VII (1911) 515 ; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 19.

Woodrowia diandra Stapf in Hook. Ic. Pl (1896) t 2447, Hook f Fl Brit Ind VII (1896) 241, Lisboa Bomb Grasses (1896) 94, Cooke Fl Bomb II (1908) 1012

By uniting the two species the genus *Woodrowia* Stapf ceases to exist

Vernacular name : Kotir

Etymology : *Diandra* means having 2 stamens.

Description : An annual grass 45-60 cm high. Lower leaves 7.5-10 cm by 2-4 mm., narrowly linear, setaceous acuminate, uppermost leaves reduced or entirely suppressed, hirsute, margins scabrid, sheaths close, glabrous or hairy at the mouth, ligule short, truncate, ciliate.

Panicle about 5 cm long, rhachis slender, pedicels very short, 1 mm. long, branches of panicle about 4. Spikelets 6 mm long, rather distant, green or tinged with violet. Glumes 4: lower involucreal glume more or less dorsally hairy, with ciliate margins, upper involucreal glume with a densely ciliate keel, lower floral glume obovate-oblong, hyaline, nerveless, upper floral glume 2-lobed, with a geniculate awn about 12 mm long from the sinus, column of awn 4 mm long, spirally ciliate, brown, the upper part of the awn yellow, longer than the column. Lodicules unequally lobed. Grain yellow, glabrous, 6-8 mm long.

Locality : Konkan Vasco da Gama (Blude!), Marmagao (Talbot 2557!), Vikroh, near station (McCann 1019!)

W Ghats Khandala, open grass-land (Saxton & Blude!, McCann A317!), Castle Rock (Blude!)

N Kanara Kumberwada (Talbot 2261!), Kadra (Talbot 2822!), Devmane (Talbot 3547!), Jog to Siddhapur, open grass-land, rocky soil (Hallberg & McCann A314!); Mirjan (Hallberg & McCann A315!)

Ecology : A plant of open grass-land, frequently forming almost pure formations over large areas, often associated with species of *Eulalia*. On the whole a weak plant, but as the formations are very close, it can stand against wind and rain. A monsoon species, growing on well-drained soil.

Flowering about the middle of August.

Distribution : W Peninsula

6 ISCHAEMUM Linn

Generally perennial, blades convolute when young, at length flat, ligules generally membranous.

Racemes compressed, joints flattened or subconcave on the inner side and often stout, sessile spikelets dorsally compressed, often rather broad, the pedicelled sometimes apparently laterally compressed with a median keel owing to the more or less complete suppression of one side. Spikelets of each pair alike, or differing only in sex, or more or less heteromorphous, one sessile or subsessile, the other pedicelled on the articulate fragile rhachis of 2-nate, digitate or fascioled, spike-like racemes, the pedicelled falling from their pedicels, the sessile deciduous together with the adjacent joint of the rhachis and the pedicel. Florets 2, lower generally male, upper hermaphrodite, rarely male or neuter in the pedicelled spikelets. Sessile spikelet: involucreal glumes equal or subequal, lower dorsally flattened or somewhat convex and usually coriaceous below, chartaceous and markedly nerved upwards, rarely shallowly concave and more or less chartaceous throughout, more or less 2-keeled with inflexed margins; upper boat-shaped keeled at least above, sometimes awned. Floral glumes rigidly membranous to hyaline, of lower floret mucous, of upper usually 2-fid and awned from the sinus, rarely mucronate or mucous. Paleae more or less equalling their floral glumes, hyaline. Lodicules 2, euneate. Stamens 3, sometimes smaller or rudimentary in the fertile flower. Stigmas linear-oblong, laterally exerted. Grain oblong or lanceolate, dorsally compressed, embryo reaching to the middle of the grain. Pedicelled spikelet in structure like the sessile, or more or less reduced, male or neuter and awnless.

Species about 50—All belonging to the Old World, except 3 found in tropical America.

Cooke describes 12 species. Of these *Ischaemum angustifolium* has to go under *Pollandrium* and *Ischaemum laxum*, *sulcatum* and *spathiflorum* under *Schima*. Instead 3 species new to the Presidency will be added to the genus *Ischaemum*, viz, *I. impressum* Hack., *I. conjugatum* Roxb. and *I. timorensis* Kunth.

In *Ischaemum* the racemes are geminate or digitate.

Several species of this genus may be termed hygrophylous and under suitable conditions flower throughout the year. In these cases it will probably be possible to distinguish two distinct forms; those which flourish during the dry season and those which grow during the monsoon months. Before such a division can be made it will be necessary to gather much mat-

erial at different times of the year For the present we can only say that there appears to be a reduction in the size and details of such plants

A. Margins of lower involucrel glume of sessile spikelet inflexed or incurved from base to apex

I. Leaves rounded at the base (slightly cordate in *I. molle*), sessile on the sheath.

1. Pedicel of upper spikelet less than one-third the length of the lower spikelet

- a. Lower involucrel glume of sessile spikelets with nodulose margins . . . 1. *I. aristatum*
- b. Lower involucrel glume of sessile spikelets closely transversely ribbed . . . 2. *I. rugosum*
- c. Lower involucrel glume of sessile spikelets dorsally villous all over, not transversely ridged nor with nodulose margins . . . 3. *I. molle*.

2. Pedicel of upper spikelet one-third the length of the lower spikelet or more

- a. Upper involucrel glume of sessile spikelets 2-fid, 3-nerved . . . 4. *I. dyplopogon*.
- b. Upper involucrel glume of sessile spikelets acuminate, 5-nerved . . . 5. *I. pilosum*

II. Leaves hastate or cordate at the base, often petioled

1. Pedicel of upper spikelet not one-third of the lower spikelet

- a. Leaves 7.5-13 cm. long . . . 6. *I. semisagittatum*.
- b. Leaves 25-35 cm long . . . 7. *I. conjugatum*

2. Pedicel of upper spikelets as long as the lower spikelet, or longer . . . 8. *I. impressum*.

B. Margins of lower involucrel glume of sessile spikelets broadly incurved below the middle

I. Keel of upper involucrel glume winged above the middle.

- 1. Sessile spikelets 3 mm long, callus large, glabrous; awn 4 mm long . . . 9. *I. Lisboae*.
- 2. Sessile spikelets 5 mm long; callus short, bearded, awn 12 mm long . . . 10. *I. calvare*.

II. Keel of upper involucrel glume not winged . . . 11. *I. timorensis*.

1. ISCHAEMUM ARISTATUM Linn.

PLATE 6

Ischaemum aristatum Linn Sp Pl (1753) 1049, Kunth Enum Pl I (1833) 512, Suppl 421, Haek. Monogr. Androp (1889) 202, Hook. f. Fl. Brit. Ind. VII (1896) 126; Grah Cat. Bomb Pl (1839) 239, Dalz & Gibs Bomb. Fl. (1861) 306, Cooke Fl Bomb. II (1908) 958, Ranga Achariyar South Ind Grasses (1921) 151.

I. imberbe Retz Obs VI (1791) 35.

Vernacular names : Bangadi, Kanden, Bherda, Guj.

Etymology : *Ischaemum* is the Greek *ischamos*, staunching blood.—*Aristatum* means being provided with an awn

Description : Perennial, stems 30-120 cm high, stout, erect or decumbent at the base, simple or branched above, leafy, glabrous, thickened at the top below the spikes. Leaves 10-25 by 0.6-2.5 cm, linear-lanceolate, finely acuminate, glabrous or sparsely hairy, glaucous beneath, narrowed to the acute or subcordate base, with scabrid margins, sheaths loose, glabrous, the mouth naked, auricled, ligule membranous

Racemes 1 or 2, stout or slender, 2.5-10 cm long. Spikelets reaching 5 mm. long, a sessile and a pedicellate closely pressed together, callus of sessile spikelets broad, thick, 1 mm. long. Sessile spikelets lower involucrel glume 5 mm, long, broadly oblong, cartilaginous and often purplish below the middle, with 2-4 marginal nodules on each edge transversely connected by shallow ridges, thinner above the middle, with green anastomosing veins, tip obtuse or 2-dentate, margins narrowly incurved, ciliate, upper involucrel glume lanceolate, acuminate,

1-nerved, with smooth rounded keel; lower floral glume ovate-lanceolate, acuminate, 1-nerved, membranous, male or 2-sexual, with an oblong palea, upper floral glume female, cleft to or below the middle into lanceolate acuminate lobes, with a brownish red awn 13 mm or more long at the sinus, twisted below, straight above; palea linear-oblong. Pedicellate spikelets as long as the sessile, articulate on the very thick amorphous pedicel, which is densely silky-hairy at the base, lower involucre glume gibbous or scimitar-shaped, acute, coriaceous, tinged with purple, with a ciliate semicircular wing; upper involucre glume and lower floral glume as in the sessile spikelets; upper floral glume hyaline, with a mucro or very short awn.

Locality: *Khandesh*. W. Khandesh (Blatter!).

Konkan. Bassein (McCann 4474!), Sion, Bombay (McCann 5233!), Bhandup (McCann 9899!), Parsik, railway line (McCann 9901!); Matunga, near Bombay (Woodrow 4).

W Ghats. Igatpun (Blatter & Hallberg 5169!); Khandala, on rocks (McCann 9908!), Lonavla (Garade!); Mahableshwar (Talbot 4534!); Panchgani (Blatter & Hallberg B1216!), Pasarni Ghat (Blatter & Hallberg B1307!), Castle Rock (Blide!).

Deccan. Lohagad, half way up (McCann 9906!), Deolali (Blatter & Hallberg 4554!).

S. M. Country. Devarayi (Sedgwick & Bell 4456!), Belgaum (Ritchie 812/2).

Distribution: India (also on higher hills), Ceylon, China, Malaya.

Explanation of Plate 6: *Ischaemum aristatum* Linn.

- | | | |
|-------------------------------------|---|----------------------|
| 1. Lower invol. glume. | } | Pedicelled spikelet. |
| 2. Upper invol. glume | | |
| 3. Lower floral glume | | |
| 4. Stamens. | | |
| 5. Palea of lower floral glume. | | |
| 6. Upper floral glume | | |
| 7. Palea of upper floral glume. | | |
| 8. Styles. | } | |
| 9. Ligule. | | |
| 10. Part of spike | | |
| 11. Lower invol. glume | } | Sessile spikelet. |
| 12. Upper invol. glume. | | |
| 13. Lower floral glume | | |
| 14. Stamens | | |
| 15. Lodicules | | |
| 16. Palea of lower floral glume. | | |
| 17. Upper floral glume | | |
| 18. Stamens, styles, and lodicules. | | |
| 19. Palea of upper floral glume. | | |

2. ISCHAEMUM RUGOSUM Salisb.

PLATE 7

Ischaemum rugosum Salisb. *Io. Sturp. Rar.* (1791) 1, t. 1; *Roxb. Fl. Ind.* I (1832) 320; *Hack. Monogr. Androp.* (1889) 206; *Duthie Grasses N. W. Ind.* (1883) 18, *Fodder Grasses N. Ind.* (1888) 31, *Hook f. Fl. Brit. Ind.* VII (1896) 127; *Grah. Cat. Bomb. Pl.* (1839) 239; *Dalz. & Gibs Bomb. Fl.* (1861) 305; *Watt. Dict. Econ. Prod.* IV, 531; *Cooke Fl. Bomb.* II (1908) 959, *Ranga Acharyar South Ind. Grasses* (1921) 31.

I. Royleanum Miq. *Fl. Ind. Bat.* III, 498.

I. segetum Trin. in *Mem. Acad. Petersb.* Ser. 6, II (1833) 294.

Meoschum Griffiths Nees & Arn. in *Ann. & Mag. Nat. Hist.* I (1838) 284.

M. Arnottianum Nees

M. elegans Arn. & Nees

M. rugosum Nees

M. Wightianum Nees

M. Royleanum Nees ex Steud. *Syn. Gram.* (1854) 375.

Andropogon Arnottianus

A. Griffithsiae

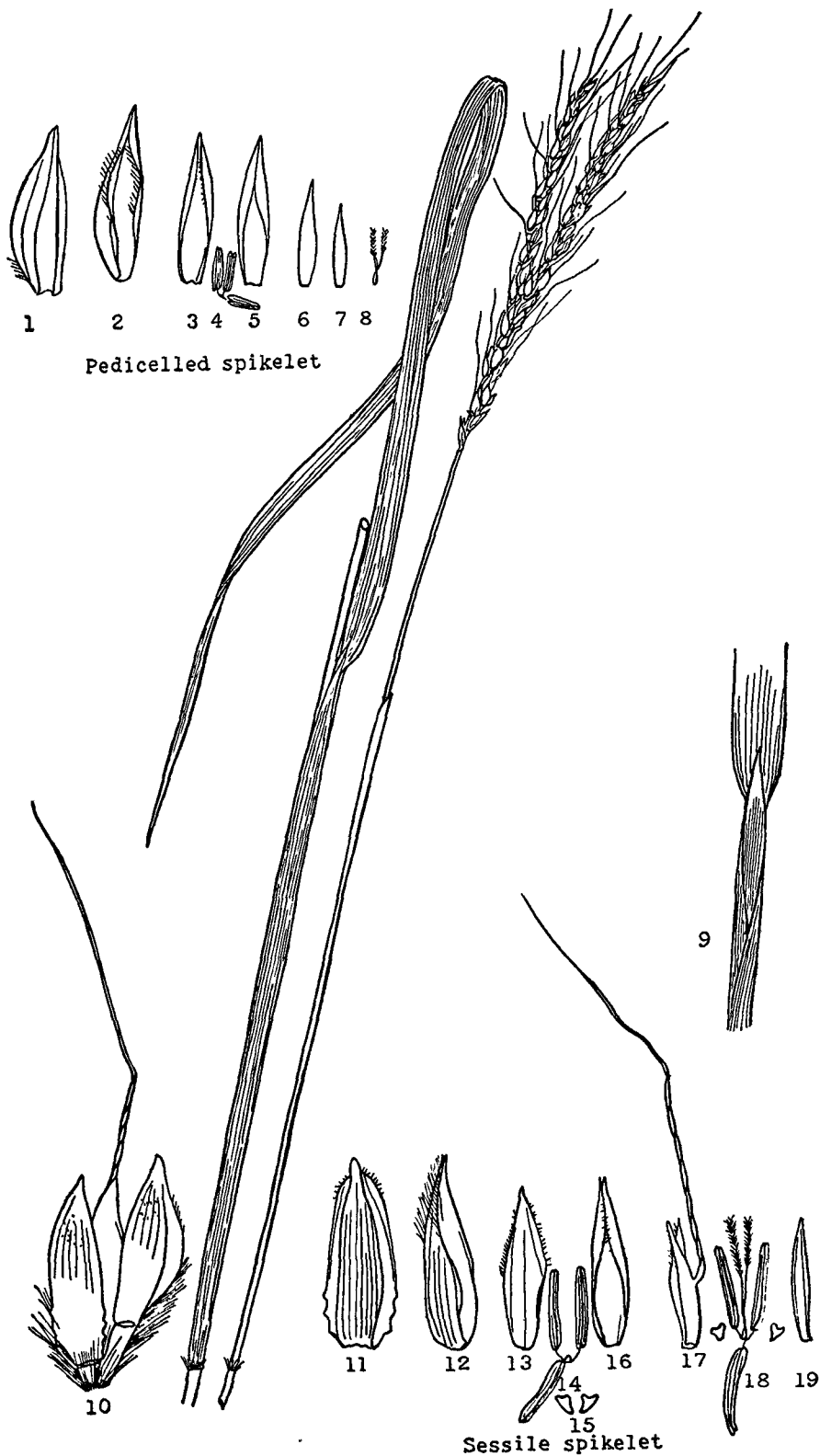
A. segetum

A. Tong-dony

Colladoa distachya Cav. *Io.* (1791-1801) 37, t. 460.

} in *Nov. Act. Nat. Cur.* XIX, Suppl. I (1843) 199, in *Pl. Meyen.*, 200.

} Steud. 1. c. 375, 376.



ISCHAEMUM ARISTATUM LINN

Delin: B. K. Bhida.



Sessile spikelet

ISCHAEMUM RUGOSUM SALISB

Drawn by: R K Bh

Vernacular names : Lag, Bardi, Bar, Bher, Karkel, Tikl grass.

Etymology : *Rugosum* means wrinkled, alluding to the lower floral glumes which are rugose.

Description : Annual, stems 30-60 cm long, erect or ascending, slightly thickened beneath the inflorescence, leafy, compressed, nodes glabrous or bearded. Leaves 10-15 cm. by 4-13 mm, linear-lanceolate, acuminate, flat, glabrous or sparsely hairy, the margins scabrid, the uppermost leaves often reduced to spathiform lanceolate sheaths which partially enclose the racemes; sheaths compressed, loose, glabrous, the mouth auricled, the auricles membranous, confluent with the truncate ligules.

Racemes usually 2, erect, pale yellow, glabrous, 2.5-5.5 cm. long, fragile, rhachis trigonous, ciliate on the dorsal angle. Spikelets reaching 6 mm. long or more, linear-oblong, the sessile and pedicellate closely pressed together, pedicel of the latter very short and thick, clavate, angular, confluent with the bristly thick callus of the sessile spikelet. Sessile spikelets. Lower involucre glume cartilaginous for two-thirds of its length from the base, the cartilaginous portion pale yellow, shining, concave, crossed by 3-6 deep smooth ridges, the upper third flattened, thinner, membranous, obtuse, with green veins, the margins narrowly incurved, the outer margin winged, upper involucre glume oblong-lanceolate, acuminate, keeled, the keel with a narrow ciliate wing below the tip, lower floral glume ovate-lanceolate, acuminate, hyaline, male or empty, paleate, the palea hyaline, narrow; upper floral glume 4 mm. long, deeply cleft into 2 acute lanceolate lobes; palea linear-lanceolate, awn reaching 16 mm. long or more. Pedicellate spikelets variable, rather shorter than the sessile; lower involucre glume like that of the sessile or with fewer or sometimes more or less obscure transverse ridges, the upper half of the glume broader and more oblique, upper involucre glume not keeled, otherwise as in the sessile spikelet; lower floral glume as in the sessile, upper floral glume oblong, obtuse, not awned.

Locality : *Konkan :* Bombay Isl. (Blatter !), Kankeshwar Hills, Alibag (Bhude !); Bassem (McCann 4479 !).

W. Ghats : Igatpuri, common (McCann 4348 !); Khandala, common, Echo Point in a dry pool (McCann 9903 !).

Deccan : Poona (Woodrow).

N. Kanara : Halyal (Talbot 2140 !).

Ecology : Common in wet marshy ground. According to Roxburgh it is generally found growing amongst Rice, and it is so much like it that until the plants have come into flower they are with difficulty distinguished from it. Davidson observes that it injures Rice plants.

Distribution : India, Ceylon, China, Malaya.

Explanation of Plate 7 : *Ischaemum rugosum* Salisb.

- | | |
|---|---------------------|
| 1. Spikelet and joint of rhachis | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Palea of lower floral glume and stamens. | |
| 6. Upper floral glume. | |
| 7. Palea of upper floral glume. | |
| 8 Grain. | |

3. ISCHAEMUM MOLLE Hook. f.

Ischaemum molle Hook. f. Fl. Brit. Ind. VII (1896) 128; Lisboa Bomb. Grasses (1896) 50; Cooke Fl. Bomb. II (1908) 959.

Etymology : *Molle* means soft, alluding to the spikes being densely silky-villous.

Description : Stem 90-120 cm. long, solid, smooth, stout, leafy. Leaves 15-25 cm. by 6-8 mm, linear, finely acuminate, sparsely hairy, base rounded, cordate; sheaths 10-15 cm. long, smooth, glabrous, or sparsely hairy above, the mouth villous.

Racemes 1-2, axillary and terminal, 7.5-12.5 cm. long, densely villous with soft white hairs. Spikelets reaching 5 mm. long; callus of sessile spikelets very short and broad. Sessile spikelets. Lower involucre glume thinly coriaceous, broadly ovate, obtuse, dorsally villous all over, many-nerved; upper involucre glume chartaceous, obtuse, silky, keeled, the keel with a narrow ciliate wing from the middle upwards; lower floral glume ovate, obtuse, hyaline, 3-nerved, ciliate, paleate, the palea as long as the glume, narrow, obtuse, upper floral glume shorter than the lower one, cleft to the middle into 2 lanceolate acuminate ciliate lobes; palea small, narrow; awn nearly 19 mm. long, the lower half dark brown, the upper half yellowish white. Pedicellate spikelets rather smaller than the sessile, with similar glumes but awnless.

Locality : *Konkan* : Sion creek (Sabnis 9900 !).

W. Ghats : Igatpuri (McCann 9543 !); Khandala, railway line (McCann 9944 !); Lonavla (Bhude !, Woodrow)

Distribution : W. Peninsula, Central Provinces.

4. *ISCHAEMUM DIPLOPOGON* Hook. f

PLATE 8

Ischaemum diplopogon Hook. f. Fl. Brit. Ind. IX (1896) 129; Lasboas Bomb. Grasses (1896) 50; Cooke Fl. Bomb. II (1908) 960.

Etymology : *Diplopogon* is a combination of *diplos*, two-fold, and *pogon*, beard, or, in other words, a double beard, alluding to the upper involucreal glume having the lateral nerves pectinately ciliate near the apex with long erect hairs

Description : Annual, stem 30-50 cm. long, branched from the base and upwards; nodes glabrous, internodes long. Leaves 7.5-15 cm. by 6-16 mm., linear-lanceolate from a narrow base, acuminate, with many slender nerves, dark green and shining above; sheaths glabrous, those of the upper leaves open, spathiform; ligule an oblong glabrous membrane.

Peduncles many from the upper spathe-like sheaths, solitary, filiform, the spathes 2.5-7.5 cm. long, lanceolate. Racemes usually 2, compressed, 2.5-4.5 cm. long; joints and pedicels half the length of the lower spikelets or longer, subclavate, dorsally rounded, ventrally concave. Sessile spikelets : callus nearly 1.25 mm. long, thick. Spikelets reaching 6 mm. long. Glumes 4; lower involucreal glume 6 mm. long, oblong, shortly 2-cuspidate, obscurely nerved and with shortly incurved margins; upper involucreal glume 5 mm. long, ovate, subacute, shortly 2-fid, 3-nerved, the lateral nerves pectinately ciliate near the apex with long erect hairs and furnished with a slender whitish awn 5 mm. long, lower floral glume linear-oblong, hyaline, 1-nerved; upper floral glume 4 mm. long, 2-fid at the apex into acute lobes, hyaline; palea small, oblong; awn reaching 16 mm. long, the lower half brown, the upper yellowish white. Pedicellate spikelets often imperfect, not awned.

Locality : *W. Ghats*. Mahabaleshwar (Woodrow 4), wet rocks in a stream (Sedgwick & Bell 4595 !), Matheran (Woodrow); Khandala (McCann !); Lonavla, Sakar Pathar (Gammie 15963 !).

Deccan : Ambergwad, Nasik Dist. (Patwardhan !), Bhorkas, near Poona (Woodrow 3 !).

Ecology : This plant is found sporadically.

Distribution : W. Peninsula

Explanation of Plate 8 : *Ischaemum diplopogon* Hook. f.

- | | | |
|--|---|----------------------|
| 1. Lower invol. glume. | } | Pedicelled spikelet. |
| 2. Upper invol. glume. | | |
| 3. Lower floral glume. | | |
| 4. Upper floral glume. | | |
| 5. Spikelets. | } | Sessile spikelet. |
| 6. Lower invol. glume. | | |
| 7. Upper invol. glume. | | |
| 8. Lower floral glume with stamens and styles. | | |
| 9. Palea of lower floral glume. | | |
| 10. Upper floral glume. | | |
| 11. Palea of upper floral glume. | | |
| 12. Grain. | | |

5. *ISCHAEMUM PILOSUM* Hack.

PLATE 9.

Ischaemum pilosum Hack. Monogr. Androp. (1889) 240; Duthie Fodder Grasses N. Ind. (1888) 31; Grah. Cat. Bomb. Pl. (1839) 239, Dalz. & Gibs. Bomb. Fl. (1861) 305; Lasboas Bomb. Grasses (1896) 51; Hook. f. Fl. Brit. Ind. VII (1896) 130; Cooke Fl. Bomb. II (1908) 961.

Spodiopogon pilosus Nees ex Steud. Syn. Pl. Glum. (1855) 373.

Andropogon pilifer Steud. l. c.

A. pilosum Klein ex Willd. Sp. Pl. IV, 920.

Vernacular names : Kunda, Nuth, Dungi-kunda, Pharari, Khavo, Kanigyanhulla.

Etymology : *Pilosum* means hairy, alluding to the spikes being clothed with long white hairs.



ISCHAEMUM DIPLOPORON HOOK. F

Delin: R. K. B.



Sessile spikelet

ISCHAEMUM PILOSUM HACK.

Delin. B. K.

Description : Rhizome giving out densely scaly long stolons; stems erect, 60-90 cm. long, slender, terete, glabrous, nodes glabrous. Leaves 15-30 cm. by 5-8 mm., linear, finely acuminate, glabrous, sheaths glabrous; ligule rounded, 2-3 mm long, membranous, glabrous.

Racemes 2-6, fascicled, 2.5-10 cm long, yellow or brownish, pilose; rachis hairy, joints and pedicels slender, compressed, subclavate, shorter than the sessile spikelets, sparsely ciliate; pedicel about half as long as its spikelet. Sessile spikelets narrowly lanceolate, reaching 6 mm. long; callus minute, bearded with long hairs. Glumes 4; lower involueral glume chartaceous, narrowed from the middle upwards, dorsally hairy, the margins incurved throughout their whole length, the nerves anastomosing, upper involueral glume rather longer than the lower, chartaceous, ovate-lanceolate, acuminate, laterally compressed, 5-nerved, the lateral nerves anastomosing, lower floral glume a little shorter than the upper involueral glume, linear-oblong, obtuse, ciliate above, paleate, male, the palea acute, membranous, nerveless, glabrous, upper floral glume equalling the lower one, cleft almost to the middle into acute ciliate lobes, palea a little shorter, lanceolate-subulate, nerveless, awn 6-10 mm. long. Pedicellate spikelets 4-5 mm. long, like the sessile but usually with a shorter awn, sometimes imperfect or reduced to a single glume.

Locality : *Gujarat*. Surat, roadside (Sedgwick!).

Khandesh. (Lisboa), Amalner (Blatter & Hallberg 4397!).

Deccan. Poona (Bhide!), Ganeshkhund Bot. Gard., Kirkee (Gammie!), Chhattarshinji Hill, Poona (Ezekiel!), Mangri, 8 miles E of Poona (Herb Econ. Bot Poona!); Yeravda (Herb Econ. Bot. Poona!); Kirkee (Talbot!), Satara (Lisboa), Sholapur (Lisboa).

S. M. Country. Kunemelhali (Sedgwick 2138!), Dharwar (Sedgwick & Bell 5341!), Haveri, black soil field (Talbot 2185!), Gadag (Talbot 2185!), 7 miles S of Hubli, black soil field (Sedgwick 5341!).

Ecology : A characteristic black soil species. It is reported to infest the black cotton soil, to the great detriment of cultivation.

Distribution : W. Peninsula, Central Provinces, Rajputana.

Economic uses : Said to be a good fodder in some places, at Poona they call it a good fodder when young.

Explanation of Plate 9 : *Ischaemum pilosum* Hack.

- | | | |
|--|---|-------------------|
| 1. Joint of rachis and spikelets. | } | Sessile spikelet. |
| 2. Lower invol. glume. | | |
| 3. Upper invol. glume. | | |
| 4. Lower floral glume | | |
| 5. Palea of lower floral glume, lodicules and stamens. | | |
| 6. Upper floral glume | | |
| 7. Palea of upper floral glume | | |
| 8. Stamens, styles and lodicules. | | |

6. ISCHAEMUM SEMISAGITTATUM Roxb.

PLATE 10.

Ischaemum semisagittatum Roxb. Hort. Beng. (1814) 8, Fl. Ind. I (1802) 320, Hack. Monogr.

Androp. (1889) 208, Lisboa Bomb. Grasses (1896) 51; Hook. f. Fl. Brit. Ind. VII (1896) 130; Cooke Fl. Bomb. II (1908) 961

Spodopogon semisagittatus Voigt Hort. Suburb. Calo. 706.

Meoschium semisagittatum Schult. Mant. II, 435

Andropogon semisagittatum Steud. Syn. Pl. Glum. (1855) 376.

Vernacular names : Delaga, Ber, Saj-kadi, Kari.

Etymology : *Semisagittatum* means half-arrow-shaped in allusion to the leaves which are cordate or sagittate at the base

Description : Annual. Stems 30-60 cm long, decumbent at the base, then ascending, slender, terete, nodes glabrous, internodes long. Leaves 5-7.5 by 1-1.6 cm., oblong-lanceolate, acuminate, with capillary tips, base auricled, broadly cordate or sagittate, the lower leaves with a filiform petiole reaching nearly 2.5 cm. long, the upper sessile, glabrous or sparsely hairy, the margins scabrid; sheaths loose, glabrous, those of the uppermost leaves spatheform; ligule oblong, 3 mm. long, obtuse, pilose

Racemes 2, more or less softly villous with long white or grey hairs, 2.5-6.3 cm. long, fragile; internodes and pedicels much shorter than the spikelets, trigonous. Sessile spikelets 4-6 mm. long, callus short, bearded with long hairs. Glumes 4; lower involueral glume ovate, convex, the lower half cartilaginous, with 3-5 obscure or more or less conspicuous ridges ending in marginal nodules, the upper half chartaceous or membranous, with green veins and ciliate margins;

upper involucrel glume equalling the lower, ovate-oblong, obtuse, coriaceous; lower floral glume a little shorter than the lower involucrel glume, ovate, acuminate, 1-3-nerved, paleate, male, the palea linear-oblong, hyaline, 2-nerved, upper floral glume female, cleft to below the middle into acute glabrous lobes, palea linear-oblong; awn 13-17 mm. long. Pedicellate spikelets rather shorter and narrower than the sessile, closely appressed to the sessile, with very broad pedicels 1 mm. long; lower involucrel glume narrowly oblong, ridged or not; upper involucrel and lower floral glumes as in the sessile spikelets; upper floral glume narrowly oblong, tip 2-toothed with a minute awn.

A weak plant with ascending stems. The lower nodes throw out wry roots to support the culm. The cordate and sagittate leaves readily distinguish it from any other species in the Presidency. The lamina of the petioled leaves turn freely on the petioles with the slightest breeze.

The lower involucrel glume of the sessile spikelet is frequently bifid, the thin membrane between the margins breaking down and bringing about this condition. We do not agree with the statement of most authors that the lower involucrel glume of the pedicelled spikelet is not ridged. This is true of the uppermost spikelets, but those lower down in the spike are distinctly ridged, though slightly. The condition varies as one ascends the spike.

Locality : *Khandesh* : W Khandesh (McCann !).

Konkan : Bombay, Sion (McCann 5251 !), Sewri (McCann 3586 !), Parel (Woodrow), Bassem (McCann 4482 !); Kanari Caves (McCann 9914 !), Thana (Lisboa); Marmagao (Talbot 2560 !).

Deccan : Satara (Lisboa)

W Ghats : Igatpuri, very common (McCann 4319 !); Khandala, very common (McCann 9613 !), Lonavia (Bhide !, Woodrow); Mahableshwar, in forests (Sedgwick & Bell 4802 !); Castle Rock (Bhide !), Dudhsagar Falls (McCann !).

N Kanara : Anmod (Sedgwick 3273 !); Supa (Talbot 2092 !); Jugglepet (Talbot 2089 !), Yellapur (Talbot 738).

Ecology : This is a gregarious grass, very abundant on the crest of the Ghats in N. Kanara. Growing usually in the shade of trees. Common throughout the lower regions of the Presidency.

Distribution : Bengal, W. Peninsula, Ceylon

Explanation of Plate 10 : *Ischaemum semisagittatum* Roxb.

- | | |
|---------------------------------------|---------------------|
| 1. Joint of rhachis | |
| 2. Dorsal view lower invol. glume | |
| 3. Spikelets. | |
| 4. Ventral view of lower invol glume. | } Sessile spikelet. |
| 5 Upper invol glume | |
| 6. Lower floral glume. | |
| 7. Palea of lower floral glume | |
| 8. Upper floral glume. | |
| 9 Palea of upper floral glume | |

VAR DASYANTHA Hack.

Var. dasyantha Hack. Monogr. Androp. (1889) 209, Cooke Fl. Bomb. II (1908) 962.

Ischaemum conjugatum Roxb. Hort. Beng (1814) 8, Fl Ind. I (1832) 321, Grah. Cat. Bomb. Fl. (1839) 239, Dalz. & Gibb. Bomb. Fl. (1861) 305.

Etymology : *Dasyantha*, from *dasy*, hairy, shaggy, and *anthos*, flower, alluding to the villous lower involucrel glume, at least in the upper spikelets.

Description : Lower involucrel glume appressedly villous at least in the upper spikelets; joints scabrous with hairy margins and keel

Locality : *Konkan* : (Stocks ex Cooke)

N. Kanara . (Woodrow !)

7. ISCHAEMUM CONJUGATUM Roxb.

PLATE 11.

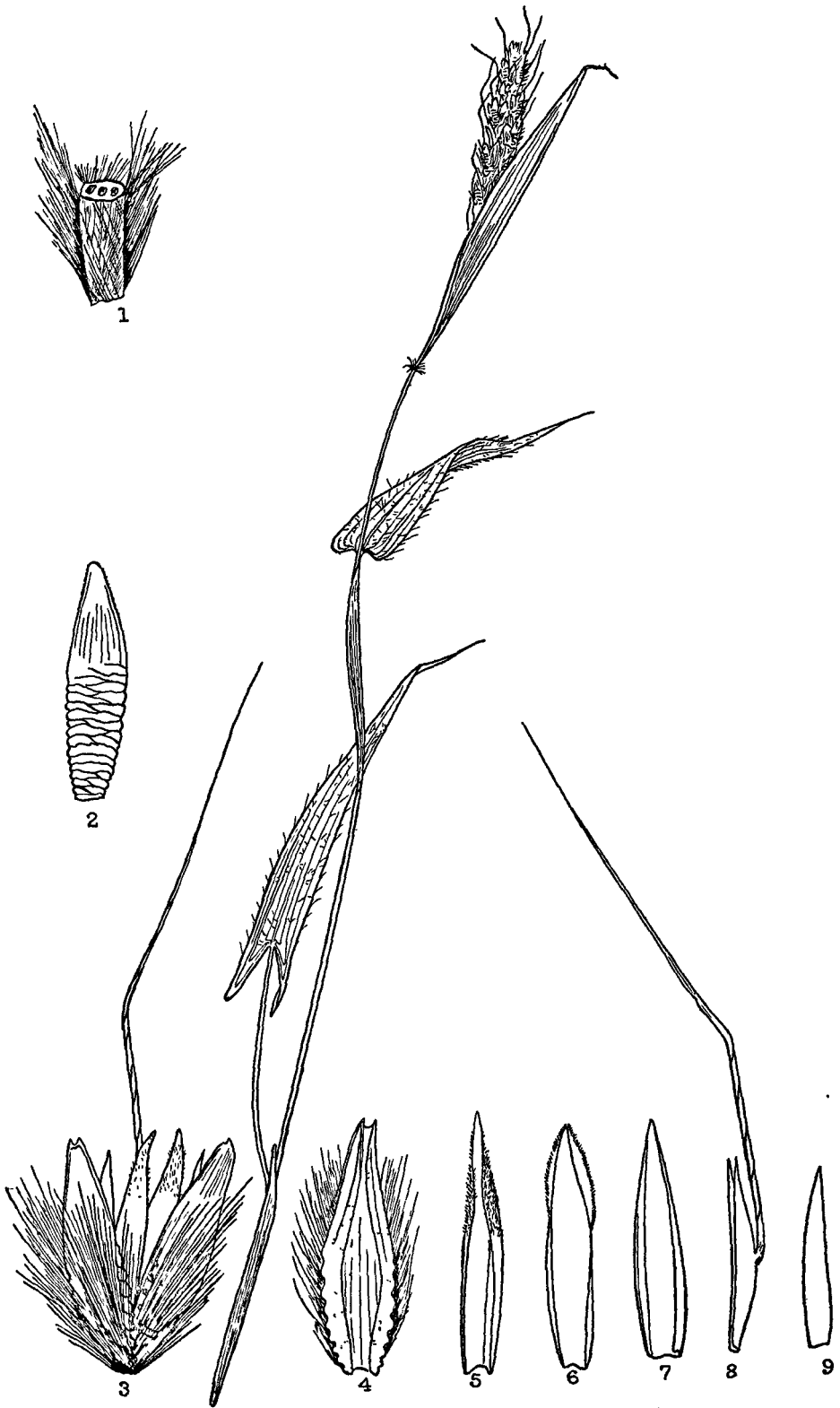
Ischaemum conjugatum Roxb. Fl. Ind. I (1832) 321 (*non* Roxb. Hort. Beng. (1814) 8); Hack.

Monogr. Androp. (1889) 205; Hook. f. Fl. Brit. Ind. VII (1896) 131.

Spodopogon conjugatus Voigt Hort. Suburb. Cal. 706.

Andropogon cordatifolius Steud. Syn. Pl. Glum. (1855) 376.

Etymology : *Conjugatum* means united; what it refers to we are not able to say.



Sessile spikelet

ISCHAEMUM SEMISAGITTATUM ROXB.

Delin. R. K. Bhide.



Sessile spikelet
ISCHAEUM CONJUGATUM ROXB.

Description : An annual. Stem spreading from the root and creeping, then geniculately ascending, 30-35 cm. high, slender, stiff, purplish, repeatedly branching upwards. Leaves short, 25-35 mm. long, base hastate or broadly, deeply cordate, acuminate, broadest at the base, rather rigid, striate, lower petioled, sheath of the upper ventricose and often open, ligule short, glabrous.

Spikes 2, short, 25-35 mm. long, sessile, villous; joints very short, quadrately clavate, plano-convex, ciliate. Sessile spikelets 3 mm. long, pale. Glumes 4. Lower involucrel glume oblong, obtuse, flat, 2-toothed, villous from below or above the middle to nearly the top, margins narrowly inflexed, not winged, upper half often greener, even, or lower margins obscurely nodose. Upper involucrel glume lanceolate, acuminate, strongly keeled, puberulous. Lower floral glume paleate. Upper floral glume cleft to about the middle, awn dorsally inserted at or below the cleft, slender, about twice as long as the spikelet. Pedicelled spikelets subsessile, almost awnless. Lower involucrel glume as in the sessile.

Locality : Konkan : Okda Forest (Ryan 712 !)

W Ghats : Khandala (Garade !); Mahableshwar to Pratapghad (Bhide !).

Deccan : Poona, College Farm (Pawar !).

N Kanara : Gersoppa Falls (Chibber !).

Distribution : Bengal, W Peninsula, naturalized in Ceylon.

Explanation of Plate 11 : *Ischaemum conjugatum* Roxb.

- | | |
|-----------------------------------|---------------------|
| 1 Dorsal view of sessile spikelet | } Sessile spikelet. |
| 2. Lower invol glume | |
| 3. Upper invol glume | |
| 4 Lower floral glume with stamens | |
| 5. Palea of lower floral glume | |
| 6. Palea of upper floral glume. | |
| 7. Upper floral glume. | |
| 8. Stamens and styles | |

8. ISCHAEMUM IMPRESSUM Hack.

Ischaemum impressum Hack Monogr Androp. (1889) 210, Hook f. Fl Brit Ind VII (1896) 132; Lisboa Bomb Grasses (1896) 52.

Description : Stem 10-20 cm. high, slender, prostrate below, branching upwards, quite glabrous. Leaves 5-8 cm. long, upper 18 mm. broad, ovate- or oblong-lanceolate, cordate, lower narrower, petioled, sparsely hairy beneath, margin thickened, scaberulous, sometimes crenulate, sheath compressed, glabrous, ligule oblong.

Spikes 2, yellow, joints and pedicels stout, clavate, ciliate with rigid hairs, forked at the top. Sessile spikelets 6-8 mm. long, shaggy, callus short, broad, bearded. Lower involucrel glume linear-oblong, flat, dorsally broadly irregularly depressed with shallow subsemilunar pits in the lower two-thirds, above it winged and 2-cuspidate, narrowed and margins subnodulose at the base, wings erose. Upper involucrel glume obtuse, chartaceous, ciliate, dorsally rounded with a median gibbosity and an auricle-like wing above it. Lower floral glume oblong-lanceolate, hyaline, 3-nerved, ciliate. Upper floral glume much shorter, glabrous, cleft to above the middle, awn short, geniculately inserted at the cleft. Pedicelled spikelets smaller than the sessile. Lower involucrel glume obtuse, glabrous, many-nerved, winged on one margin. Upper involucrel glume 7-nerved. Upper floral glume mucronate.

Locality : W Ghats : Igatpuri (Blatter !); Khandala, Echo Point (McCann 9943 !); Lonavla (Bhide !); Mahableshwar (Sedgwick & Bell 4514 !), Panohgam, Tableland (Blatter 5083 ! B1221 ! B1285 !).

Ecology : Subgregarious. Very abundant at Mahableshwar in damp grassy places.

Distribution : We have found this species only in the W. Ghats. Hooker f mentions the Konkan, but with a sign of interrogation. As we have never met it in the Konkan, it is not likely to occur in that region. Where Huegel's specimen comes from we cannot say, and will in all probability never be known. We think it is quite safe to say that *I. impressum* is endemic in the W. Ghats of the Bombay Presidency.

9. ISCHAEMUM LISBOAE Hook. f.

Ischaemum Lisboa Hook. f. Fl. Brit. Ind. VII (1896) 133; Lisboa Bomb. Grasses (1896) 52; Cooke Fl. Bomb. II (1908) 962.

Etymology : The specific name was given after Dr. J. C. Lisboa, the author of Bombay Grasses.

Description : Stem creeping below, very stout, rooting at the thickened nodes, branches ascending, 20-35 cm. long, glabrous. Leaves on the creeping stem 2.5-5 cm. by 6-10 mm., oblong, acute, closely imbricating in 2 series, the blades reflexed at right angles to the erect short open sheaths, softly tomentose on both surfaces, lower sheaths 13-25 mm. long, villous, ligule short, bearded with very long hairs.

Racemes 2, softly tomentose, 5 cm. long, joints and pedicels about half as long as the spikelets, stout, shortly villous, concave-convex, truncate. Sessile spikelets 3 mm. long, callus large, glabrous. Glumes 4, lower involucrel glume thickly coriaceous, dorsally convex, 2-fid, ciliate above the middle, margins broadly incurved below the middle, keels with broad auricular ciliate wings, upper involucrel glume 3 mm. long, rather longer than the lower, rigid, the keel winged above the middle, the back of the glume rounded below the wing, shortly awned, lower floral glume ovate-oblong, obtuse, with ciliate margins, paleate, male, the palea chartaceous, obovate, with broad hyaline wings above the middle, upper floral glume about 2 mm. long, 3-nerved below the middle, obtusely 2-lobed, palea lanceolate, awn about 4 mm. long.

Locality : N Kanara (Lisboa), Karwar (Talbot 22091, McCann!).

Distribution : Apparently endemic in N Kanara.

10: ISCHAEMUM CILIARE Retz.

PLATE 12

Ischaemum ciliare Retz Obs VI (1791) 36, Hack. Monogr Androp (1889) 225; Duthie Fodder Grasses N Ind (1888) 30, Lisboa Bomb. Grasses (1896) 52; Hook. f. Fl. Brit. Ind. VII (1896) 133, Cooke Fl Bomb II (1908) 962.

I. aristatum Willd Sp Pl IV, 939, Roxb Fl Ind. I (1832) 319.

I. geniculatum Roxb. l c. 322.

I. scrobiculatum Wight & Arn ex Steud. Syn Pl. Glum. (1855) 373.

Spodiopogon ciliaris Nees ex Steud. Nom. ed II, II, 625.

S. obliquivalvis Nees in Nov. Act. Nat. Cur XIX, Suppl. I (1843) 185; Duthie Grasses N. W. Ind (1883) 16.

S. zeylanicus Nees ex Steud l c 377.

S. villosus Nees in Hook & Arn Bot Beech Voy 242.

Vernacular names : Bara, Bar, Putena.

Description : Stems tufted, up to 30 cm long, erect or ascending, sometimes decumbent below and rooting at the nodes, slender, nodes glabrous or bearded. Leaves 5-15 cm by 4-13 mm, linear or linear-lanceolate, acuminate, flat, sessile, glabrous, pubescent or villous, narrowed towards the acute or rounded base, margins scabrid, sheaths glabrous or hirsute, compressed, loose, with ciliate rounded auricles, ligule short, obtuse, membranous, ciliate.

Racemes 2, rather short, 3.8-5 cm long, rhachis fragile, internodes and pedicels of upper spikelets subequal, erect, compressed, trigonous, bearded dorsally and on the angles. Sessile spikelets 4-5 mm. long, oblong or ovoid, callus very short, oblong, bearded. Glumes 4; lower involucrel glume 2-cuspidate, coriaceous, convex, smooth or pitted, hirsute below, flatter and veined above the middle, with lateral ciliate broad or narrow equal wings, the margins narrowly incurved above, broadly so below, upper involucrel glume as long as or longer than the lower, chartaceous, lanceolate, acuminate or shortly awned, 3-5-nerved, keel narrowly winged towards the tip, lower floral glume ovate-lanceolate, acuminate, ciliate near the tip, triandrous, paleate, the palea lanceolate, acuminate, opaque, with broad hyaline ciliate wings, upper floral glume cleft to the middle into oblong obtuse glabrous or ciliate lobes, female, palea lanceolate, acuminate, 2-nerved, not ciliate, awn 10-13 mm long. Anthers 3 mm long. Styles and stigmas short. Pedicellate spikelets like the sessile, the upper floral glume usually awned.

Locality : Konkan Bombay, St Xavier's College compound (McCann 4594!), Parel (Woodrow); Bassein (Ryan 445!), Salsette (Jacquemont 710); Ahbag, sandy shore (Ezekiel!); Uran (McCann 5126!), Campoli (McCann 9415!).

W Ghats Igatpuri (Blatter & Hallberg 3927A!), Khandala, very common (McCann 9612!), Castle Rock (Bhide!).

Deccan Ganeshkhind Bot Gardens (Herb. Econ Bot. Poona!).

S. M. Country Mugad, hillside (Sedgwick 1823!).

N Kanara Yellapur (Talbot 1526!), Halyal, borders of ricefields (Talbot 2141!), Ankola (Mamatdar of Ankola); Karwar, seacoast, sandy soil near Gaol (Talbot 2821!), Gersoppa Falls (McCann!); common throughout Kanara (McCann!); Kakti (Woodrow).

Ecology : Subgregarious, found in newly formed pasture land.

Distribution : India, Ceylon, China, Malaya, Australia.



Sessile spikelet

ISCHAEMUM CILIARE RETZ

Delin. B. K. Bhada.

Economic uses : Apparently not fit for cattle

Explanation of Plate 12 : *Ischaemum ciliare* Retz.

- | | |
|--|---------------------|
| 1 Lower involucrel glume of pedicelled spikelet. | |
| 2 Spikelets | |
| 3 Lower invol glume | |
| 4 Upper invol. glume with stamens | |
| 5 Lower floral glume | |
| 6 Palea of lower floral glume | } Sessile spikelet. |
| 7 Upper floral glume | |
| 8 Palea of upper floral glume with stamens and styles. | |

11. ISCHAEMUM TIMORENSE Kunth.

Ischaemum timorense Kunth Rev. Gram II (1829) 369, t 98, Hack. Monogr. Androp. (1889) 229, Lisboa Bomb Grasses (1896) 53; Hook f. Fl. Brit. Ind (1896) 136.

I. tenellum Roxb Fl. Ind. I (1832) 323

Spodiopogon Blumin Nees ex Steud Syn Pl Glum (1855) 373

Andropogon Asthenos Steud l c

A. timorensis Steud l c

Ischaemum no 4, Griff Notul 91, Ic Pl. Asiat (1847-52) t 148, fig. 1.

Etymology : *Timorense*, after the island of Timor

Description : Stem 15-45 cm high, slender, branched, straggling, nodes glabrous, or sparingly bearded. Leaves 2.5-10 cm. long, sessile and petioled, linear-lanceolate, acuminate, glabrous or sparsely hairy, base of upper rounded, of lower rounded, sheath lax, mouth hairy; ligule obscure

Spikes 2-3, 1-2 cm long, rather slender, sparingly villous, joints and pedicels about half as long as the spikelets, nearly equal, shortly ciliate. Sessile spikelets 2.5-3 mm. long, greenish or with green nerves, callus narrow, long-bearded. Lower involucrel glume ovate or ovate-lanceolate, acuminate, bicuspidate, 5-9-nerved, base ventricose, margins broadly involute below, subannuled, dorsally convex, polished, nerves strong. Upper involucrel bracts longer, acuminate or aristulate, dorsally rounded, recurved, 3-5-nerved, tip 2-toothed, dorsally usually ciliate. Lower floral glume lanceolate falcate, palea linear-oblong. Upper floral glume short, 2-lobed, glabrous, awn in the cleft very slender, shortly exserted. Pedicelled spikelets like the sessile awned

Locality : Sind. Sukkur (Mamlatdar of Sukkur)

W. Ghats : Khandala, behind the Saddle (McCann 9915 !); Lonavla (Bhide !); Mahabaleshwar, common (Sedgwick & Bell 4503 !), Londa (Bhide !)

S. M. Country : Deciduous forests W of Dharwar (Sedgwick & Bell 4500 !); Devikop (Sedgwick 2170 !); S. W of Dharwar (Sedgwick & Bell 4429 !)

N Kanara : Supa (Talbot 2101 !), Yellapur (Talbot 2327 !); Dandeli (Talbot 2494 !).

Distribution : Burma, Chittagong, Bengal, Central Provinces, Sind, W Peninsula, Ceylon, Malaya, Pacific Islands

7 SEHIMA Forsk.

Perennial or annual; blades convolute when young, at length flat, narrow; ligules a line of stiff hairs

Racemes usually gently curved, dorsiventral and laterally compressed, with the pedicelled spikelets converging over the convex side, joints and pedicels sublinear and parallel. Spikelets 2-nate, those of each pair differing in sex and also much in shape, one sessile, the other pedicelled on the articulate fragile rhachis of solitary spike-like racemes, the pedicelled tardily separating from their pedicels, the sessile deciduous together with the adjacent joint of the rhachis and the pedicel. Florets 2, lower male, upper hermaphrodite in the sessile, male or neuter in the pedicelled spikelets. Sessile spikelets involucrel glumes equal or subequal; lower deeply grooved, rarely flat, 2-dentate or 2-mucronate, more or less chartaceous, upwards acutely 2-keeled with inflexed margins, keels winged, upper involucrel glume boat-shaped, keeled upwards with a bristle-like awn. Floral glumes hyaline, of lower floret entire, muticous, of upper 2-fid and awned from the sinus. Paleae more or less equalling their valves, hyaline. Lodicules 2, cuneate. Stamens 3. Stigmas linear-oblong, laterally exserted. Grain oblong, obtusely trigonous; embryo reaching to the middle of the grain. Pedicelled spikelets flat, with a strongly nerved or ribbed lower glume, and 2 florets resembling the lower floret of the sessile spikelets, the lower or both more or less reduced and barren.

Species about 5.—India, Arabia, tropical Africa, N. America.

A. Racemes enclosed in long narrow spathes 1. *S. spathiflorum*.

B. Racemes not enclosed in spathes

I. Sessile spikelets 6-7 mm. long. Lower involucre
glume of sessile spikelet 6-nerved 2. *S. nervosum*.

II. Sessile spikelets 7-11 mm long. Lower involucre
glume of sessile spikelets 3-5-nerved 3. *S. ischaemoides*.

III. Sessile spikelet 9 mm. long. Lower involucre glume
of sessile spikelet 2-nerved 4. *S. sulcatum*.

1. *SEHIMA SPATHIFLORUM* Blatter & McCann.

PLATE 13.

Sehima spathiflorum (Hook. f.) Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927)
23.

Ischaemum spathiflorum Hook. f. Fl. Brit. Ind. VII (1896) 138; Lisboa Bomb. Grasses (1896)
54; Cooke Fl. Bomb. II (1908) 963.

Etymology : *Sehima* is formed from the Arabic name *Sochim* of *Sehima ischaemoides* Forsk.—*Spathiflorum* refers to the long flowering spathes.

● **Description :** A tall grass reaching 90-120 cm high, much branched above, branches erect. Stem as thick as a goose-quill below, leafy above, nodes glabrous. Leaves 30-45 by 2 cm, linear-lanceolate, finely acuminate, narrowed from the middle, often tinged with purple, almost petiolate, thin, sparsely hairy, margins smooth; midrib stout, nerves obscure; sheaths of lower leaves 15 cm. long and upwards, terete, quite glabrous, the sheaths of the upper leaves passing into compressed lanceolate flowering spathes 7.5-10 cm long; ligule short, scarious.

Racemes about 5 cm. long, more or less exserted from the spathes, very slender, pale straw-coloured, joints and pedicels more than half as long as the sessile spikelets, compressed, one angle ciliate. Sessile spikelets 1 cm long, narrowly linear-lanceolate, callus very short, hairy, lower involucre glume 1 cm long, thinly coriaceous, nerveless, white with dense silky hairs to above the middle, dorsal furrow very deep, causing a thick ridge on the inside of the glume, margins equally incurved, the tip 2-dentate; upper involucre glume chartaceous, dorsally convex, nerveless, but with a nerve-like fold towards the ciliate margin, keel with long cilia above the middle, scabrid towards the emarginate tip, lower floral glume shorter, hyaline, oblong-lanceolate, obtuse, 3-nerved, paleate, the palea lanceolate, the anthers imperfect, upper floral glume as long as the lower, linear, 3-nerved; palea 0; awn 3-8 cm. long, the column twisted, brown, the upper portion slender, usually purple. Pedicellate spikelets longer than the sessile; lower involucre glume 13 mm long, dorsally convex, not furrowed, lanceolate, narrowed into a bisetose often purplish awn, sparsely silky, 7-9-nerved; upper involucre glume lanceolate, acute, glabrous, lower floral glume as in the sessile spikelet; upper floral glume awnless.

Locality : *Khandesh*. Toranmal (McCann 9922!).

Konkan Pen (Bhide!); Bassein (Ryan 2300!), Kanari Caves (McCann 9920!), Island of Salsette, in hilly stony places (Jacquemont 797).

W. Ghats Igatpuri (Blatter and Hallberg 3836!, McCann!); Matheran (Paranpye!), Khandala (Woodrow), in watercourses very common (McCann 9928!); Palasdar on the Bhor Ghat, G. I. P. Ry. (Woodrow), Lonavla (Bhide!).

Deccan : Lohagad, plain (McCann 9919!); Bairawadi, Purandhar (McCann 5054!).

Ecology : Some of our specimens are typical hot season forms which are barely 45 cm. high and which in appearance are quite unlike the common monsoon form. The spathes are not so prominent in this form as they are in the monsoon form. During the monsoon the plant frequently reaches about 1.8 m. in height bearing numerous spikes, whilst the dry season form produces but few spikes. The monsoon form flowers about the middle of September. The dry season culms, devoid of the inflorescences, are frequently to be seen in dry watercourses after the monsoon. The dry weather form will only grow in or near water. The monsoon form develops stout stilt roots.

Distribution : Endemic.



Sessile spikelet

SEHIMA SPATHIFLORUM (HOOK. & ARN.) BLATTER & MCCANN.

Delin: B. K. Bhide.



Pedicelled spikelet

Sessile spikelet
SEHIMA NERVOSUM STAPF

Explanation of Plate 13 : *Sehima spathiflorum* Blatter & McCann.

- | | |
|--|---------------------|
| 1. Spikelets and joint of rhachis | } Sessile spikelet. |
| 2. Lower invol. glume | |
| 3. Upper invol. glume | |
| 4. Lower floral glume. | |
| 5. Palea of lower floral glume with stamens. | |
| 6. Upper floral glume. | |
| 7. Palea of upper floral glume. | |
| 8. Grain. | |

2 SEHIMA NERVOSUM Stapf.**PLATE 14**

Sehima nervosum Stapf in Fl. Trop. Afr. IX (1917) 36, Haines Bot. Bih. & Or. pt. 5 (1924)

1023, Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 23

S. macrostachyum Hochst. in Schimp. Pl. Abyss. no. 1705.

Andropogon nervosus Rottl. apud Willd. in Verh. Naturf. Fr. Berlin IV (1803) 218.

A. striatus Klein apud Willd. Sp. Pl. IV (1805) 903; R. Br. Prodr. (1810) 201

A. tacazensis Steud. Syn. Pl. Glum. I (1855) 369

A. macrostachys Anders. in Schweinf. Beitr. Fl. Aeth. (1867) 306.

Ischaemum laxum R. Br. Prodr. (1810) 205; Hook. f. Fl. Brit. Ind. VII (1896) 136 (*partim*);

Lisboa Bomb. Grasses (1896) 53, Cooke Fl. Bomb. II (1908) 964 (*partim*)

I. laxum var. *genunum* Hack. Monogr. Androp. (1889) 245

I. nervosum Thw. Enum. Pl. Zeyl. (1864) 305

I. macrostachyum A. Rich. Tent. Fl. Abyss. II (1851) 472

Pollinia striata Spreng. Pug. II, 12

Hologrammum nervosum Nees in Edinb. N. Phil. Jour. XVIII (1835) 185.

Vernacular names : Paunat, Pavna, Suckal, Sheda, Pal.

Description : Perennial, forming dense tufts. Culms erect, 60 to over 90 cm. high, slender, terete, simple or nearly so, about 4-noded, middle and upper internodes exerted, smooth or slightly rough below the inflorescence, glabrous. Leaves glaucous, sheaths tight, terete, striate, smooth or nearly so, glabrous or sparingly hirsute from tubercle-based hairs; ligules a line of short stiff hairs, blades linear, long attenuated to a setaceous point, up to over 30 cm. long and up to 5.2 mm. wide, rigid, more or less scabrid, glabrous, lateral nerves about 3 on each side, like the midrib whitish and prominent on both sides.

Racemes solitary, 7.5-11.5 cm. long, erect, slightly curved, joints and pedicels parallel, sublinear, slightly compressed, 4.2-5.2 mm. long, densely ciliate with white hairs along the angles, otherwise glabrous, tips more or less oblique. Sessile spikelets lanceolate-linear to linear, acuminate, 8.4-9.4 mm. long, pale green, with a shortly bearded callus. Involucral glumes subequal, lower subchartaceous to chartaceous, with an unequally 2-toothed flat and membranous beak, the teeth of which sometimes run out into ciliate mucros, deeply grooved, particularly below the middle, acutely 2-keeled, outer keel generally winged upwards, intracardinal nerves 4, with transverse veins in the upper part, like these green and raised on a white ground, upper involucral glume subchartaceous, somewhat shorter, boat-shaped, sublinear in profile, keeled above, with the keel widened at the apex and passing into a fine bristle 14.7-16.8 mm. long, 5-nerved with fine transverse veins, ciliate. Lower floret* floral glume faintly 2-nerved, hyaline, ciliate, 6.3 mm. long, with a narrow linear palea of about equal length and a male flower. Upper floret hermaphrodite. floral glume oblong-lanceolate, 5 mm. long, 2-fid, with narrow lobes, hyaline, 3-nerved, ciliate, awn up to 4.5 cm. long, slender, column spirally twisted, bronze colour very minutely ciliate along the spiral, bristle whitish, as long as the column or slightly longer; palea as long as floral glume, linear, subacute, 2-nerved, ciliate. Anthers up to nearly 4 mm. long. Styles and stigmas pale, 2.6 mm. long. Pedicelled spikelet lanceolate, acuminate, green or suffused with purple, 9.5-11.5 mm. long, glabrous; lower involucral glume slightly 2-toothed, long-ciliate from the hairs of the tightly inflexed margin, keels very narrowly or obscurely winged, wing rigidly ciliate, intracardinal nerves 5, the inner 3 very prominent and rough; upper involucral glume lanceolate, long and finely acuminate, hyaline, ciliate, 3-nerved, lower floret as in the sessile spikelet, upper floret very like the lower. Stamens smaller in the lower floret or both florets reduced and empty.

Locality : *Kathnawar* Junagad (Blatter 3799 !); Porbandar (Bhide !).

Gujarat : Surat, city walls (Herb. St. X. C. 9498 !); Ahmedabad (Sedgwick !).

Khandesh : (Lisboa); Umalla village, on Tapti River (Blatter & Hallberg 5160 !); Toranmal, common on the slopes (McCann 9916 !).

W Ghats : Khandala, St. Xavier's Villa compound (McCann 9419 !); Lonavla (Bhide !), Panchgani (Blatter & Hallberg B1269 !)

Deccan : Deolali (Blatter & Hallberg 4548 !); Poona (Woodrow), Poona to Karli (Jacquemont 530), Purandhar Fort (Bhide !, McCann 5106 !).

S M Country : Dharwar (Bhide !), Haveri (Talbot 2186 !)

Ecology : Subgregarious Very common in the Carnatic

Distribution : Bengal, Bihar, Central Provinces, Rajputana, W. Peninsula, Ceylon, tropical Australia, Somaliland, Abyssinia, Eritrea, Cape Verde Islands

Economic uses : Considered as one of the best fodder grasses.

Explanation of Plate 14 : *Setaria nervosum* Stapf.

- | | |
|--|-----------------------|
| 1 Spikelets and joint of rachis | } Pedicelled spikelet |
| 2 Lower invol glume. | |
| 3 Upper invol glume. | |
| 4 Lower floral glume with stamens | |
| 5 Palea of lower floral glume | |
| 6 Upper floral glume | |
| 7 Lower invol glume | |
| 8 Upper invol glume | |
| 9 Lower floral glume | |
| 10 Palea of lower floral glume | |
| 11 Upper floral glume (end of awn broken). | |
| 12 Palea of upper floral glume. | |
| 13 Grain. | |

3 *SEHIMA ISCHAEMOIDES* Forsk.

Setaria ischaemoides Forsk Fl. Aegypt-Arab (1775) 178, Stapf in Fl Trop. Afr. IX (1917) 37, Blatter & McCann in Journ. Bomb Nat Hist. Soc. 32 (1927) 24

S. Kotschy Hochst in Flora (1844) 247.

Ischaemum Sehima R Br Prodr I (1810) 204

I. insculptum Hochst in Schimp. Pl Abyss no 739, and Flora (1844) 247, A. Rich. Tent.

Fl Abyss II (1851) 472

Andropogon Sehima Steud Syn Pl. Glum. I (1855) 369

A. lineatus Steud. l c

A. schangulensis Rupr. ex Steud. l c

A. insculptus Anders. in Schweinf Beitr Fl. Aeth (1867) 306 (*per errorem* 310)

Ischaemum laurum R Br Prodr. (1810) 205; Hook f Fl. Brit. Ind. VII (1896) 136, *partim*.

I. laurum var *insculptum* Hack. in Monogr. Androp (1889) 245.

Andropogon rhynchophorus Stapf in Bull Soc Bot Fr LV (1908) Mem. VIII, 101.

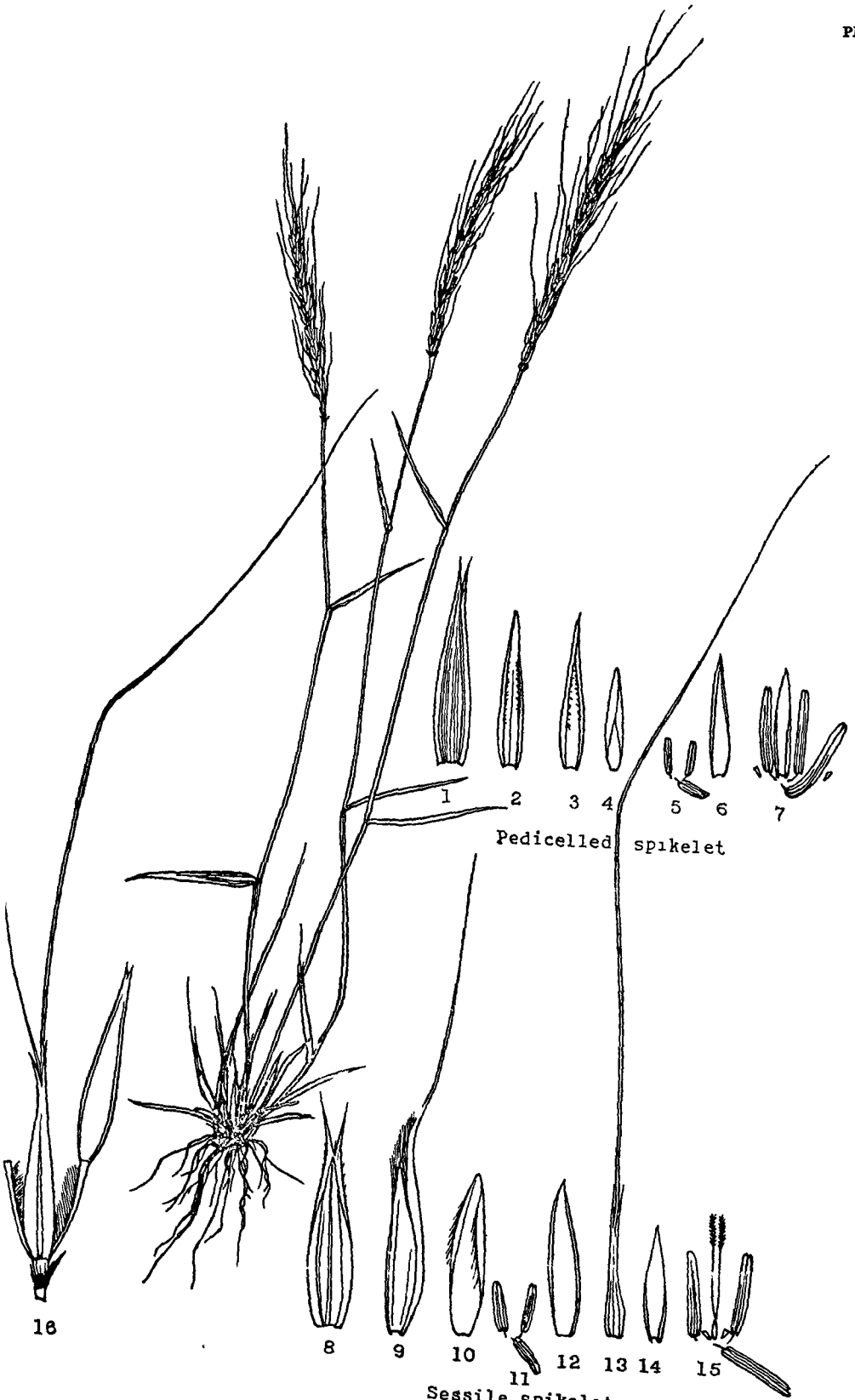
Etymology : *Ischaemoides* means resembling *Ischaemum*.

Description : Annual; culms usually in small fascicles, rarely over 45 cm high, slender, terete, simple, 2- or 3-noded, middle and upper internodes slightly exserted, smooth, glabrous. Leaves glaucous, sheath terete, tight, or the upper somewhat inflated, smooth or slightly rough, glabrous; ligules a fringe of stiff hairs, blades linear, tapering to a long fine point, up to 12.5 cm. long, 2-4 mm wide, rather firm but hardly rigid, more or less scabrid, midrib fine like the 1 or 2 primary lateral nerves

Racemes solitary, or sometimes an additional 1 or 2 from the upper nodes, 2.5-7.5 cm. long, erect or slightly nodding, joints and pedicels parallel, sublinear, slightly compressed, 4 mm long, very densely ciliate from white hairs along the angles, otherwise glabrous, tips more or less oblique Sessile spikelets linear, 9.5-15 mm long, pale green, with a shortly bearded callus; lower involucrel glume subchartaceous to chartaceous, with an unequally 2-toothed flat and membranous long beak, the teeth of which run out into mucros, deeply grooved, particularly below the middle, acutely 2-keeled, the outer keel generally winged upwards, intracardinal nerves 3-5, raised, rough, only distinct just above the groove, upper involucrel glume and florets as in *Setaria nervosum* excepting the bristle of the involucrel glume which is over 21 mm long and the awn, the column of which is generally more brown than bronze in colour, and has much longer cilia along the spirals Pedicelled spikelets narrowly lanceolate, long-acuminate (acumen up to 6 mm. long), pale green, up to 17 mm. long, glabrous; lower involucrel glume with 2 long setaceous teeth, sparingly hairy on the back, otherwise the spikelet as in *S. nervosum*.

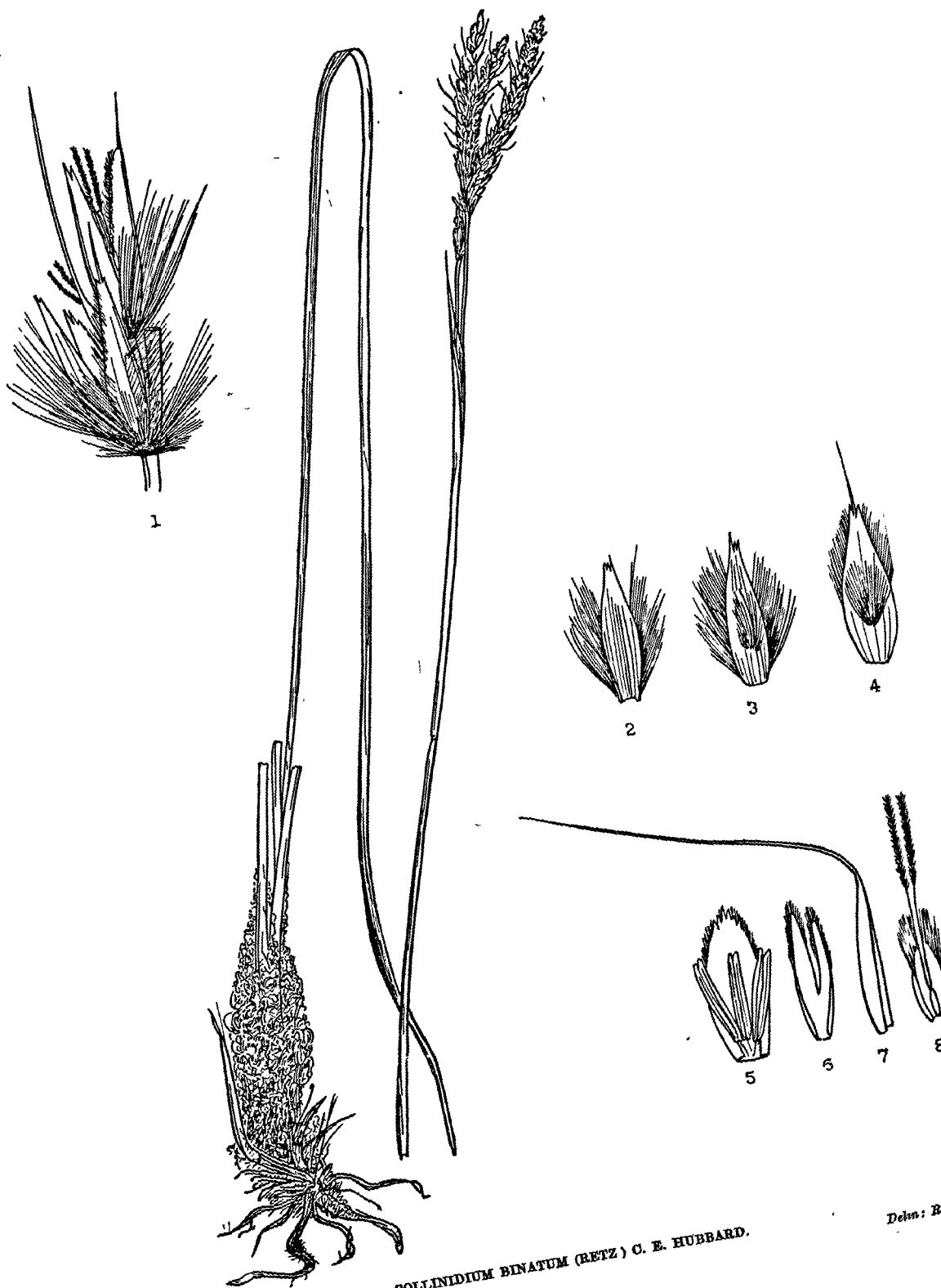
Locality : Deccan (Woodrow 147, Law, ex Stapf).

Distribution : Tropical Arabia, Yemen, Abyssinia, Sudan, Kordofan, Nubia, Cameroons, Cape Verde Islands.



SEHIMA SULCATUM (HACK) CAMUS.

Dehn · B. K. Bhida.



POLLINIDIUM BINATUM (RETZ) C. E. HUBBARD.

4. *SEHIMA SULCATUM* Camus.

PLATE 15

Sehima sulcatum Camus Bull. Mus. Hist. Nat. V (1921) 276.*Ischaemum sulcatum* Hack. Monogr. Androp. (1889) 248, Hook. f. Fl. Brit. Ind. VII (1896)

137, Lisboa Bomb. Grasses (1896) 54, Cooke Fl. Bomb. II (1908) 964

Vernacular names : Sheda, Pavna

Etymology : *Sulcatum* means grooved, alluding to the deep-channelled lower involucreal glume**Description** : Stems geniculate, ascending, reaching 50 cm long or more, weak, terete, glabrous, not ribbed, much branched from the base, nodes glabrous. Leaves 10-20 cm by 3-4 mm, linear or lanceolate, setaceously acuminate, many-nerved, glaucous, glabrous; sheaths lax, glabrous, constricted at the mouth; ligule a narrow ciliate membrane.

Raceme solitary, 5-7.5 cm. long, joints and pedicels shorter than the sessile spikelet, slender, ciliate. Sessile spikelets 1 cm long, callus about 1.5 cm long, shortly hairy at the base, cuneate, lower involucreal glume 1 cm long, subchartaceous, bicuspidate, lanceolate, scabro-punctate, the margins incurved in the upper, open in the lower part, with a furrow in the middle in the place of the midnerve and 2 nerves one at each side of and close to the furrow; upper involucreal glume rather shorter than the lower, chartaceous, 3-5-nerved, shortly 2-dentate, ciliate in the upper part and with a capillary awn 1 cm long from the sinus; lower floral glume 6 mm long, linear, subacute, with incurved margins, hyaline, paleate, the palea as long, oblong, slightly emarginate; upper floral glume 6 mm long, divided into 2 acute lobes; palea as long as the glume; awn 2-3.8 cm long, the column brown, twisted, geniculate above the column, the upper part pale, scaberulous. Pedicellate spikelets smaller than the sessile, awnless, lower involucreal glume lanceolate, bicuspidate, not furrowed, the margins recurved throughout, 7-nerved, the midrib slender, the lateral nerves green, approximate, close to the margin, upper involucreal glume not awned, lower floral glume as in the sessile spikelets; upper floral glume acute, not awned.

Locality : Deccan. Satara (Lisboa), Malsiras, Sholapur Taluka (Lisboa).*S. M. Country* : Black soil banks 35 miles S of Dharwar (Sedgwick 3745 !); banks of black soil fields 7 miles S of Hubli (Sedgwick & Bell 5342 !); Dharwar, common (Sedgwick 1819, McCann !)**Ecology** : Gregarious**Distribution** : Central Provinces, W. Peninsula**Explanation of Plate 15** : *Sehima sulcatum* Camus.

- | | | |
|--|---|----------------------|
| 1. Lower invol. glume | } | Pedicelled spikelet. |
| 2. Upper invol. glume. | | |
| 3. Lower floral glume | | |
| 4. Palea of lower floral glume | | |
| 5. Stamens | | |
| 6. Upper floral glume | } | Sessile spikelet. |
| 7. Palea of upper floral glume with stamens and lodicules. | | |
| 8. Lower invol. glume | | |
| 9. Upper invol. glume | | |
| 10. Lower floral glume | | |
| 11. Stamens | } | |
| 12. Palea of lower floral glume | | |
| 13. Upper floral glume | | |
| 14. Palea of upper floral glume | | |
| 15. Stamens, styles, and lodicules. | | |
| 16. Spikelets and joint of rachis | | |

8. *POLLINIDIUM* Stapf.

As far as we can make out the diagnosis of this genus was published for the first time in Haines, Botany of Bihar and Orissa, pt 5 (1924) 1020

Densely tufted, perennial herbs with woolly rootstock and basal sheaths. Leaves convolute when old, wiry, mouth of sheaths ciliate.

Spikes digitate or fascicled, fascicles with filiform peduncles on a more or less branched panicle. Spikelets 2-nate, sessile and pedicelled, similar, on the articulate, fragile, compressed, not stout rachis. Callus densely clothed with long brown hairs. Glumes 4. lower involucreal glume flattened, 2-3-dentate, dorsally hairy at base, 5-7-nerved, margins inflexed; upper involucreal glumeymbiform, minutely cuspidate, 3-5-nerved, with a slender awn. Lower

floral glume hyaline, sparsely ciliate, elliptic, palea finely ciliate; upper floral glume narrow, conduplicate, entire or 2-toothed, shortly awned from the tip or minute sinus, palea broad and nearly as long as the glume, densely ciliate on the top.

Species 1.—India, China, Philippines.

1. POLLINIDIUM BINATUM (Retz) C. E. Hubbard.

PLATE 16.

Pollinidium binatum (Retz) C. E. Hubbard in Kew Bull. (1932) 72.

Andropogon binatus Retz. Obs. V (1789) 21.

Pollinidium angustifolium Haines Bot. Bih. and Or. pt. 5 (1924) 1020.

Ischaemum angustifolium Hack. Monogr. Androp. (1889) 241; Lisboa Bomb. Grasses (1896) 51; Hook. f. Fl. Brit. Ind. VII (1896) 129; Cooke Fl. Bomb. II (1908) 960.

Spodopogon angustifolium Trin. in Mem. Acad. Petersb. ser. 6, II (1833) 30; Sp. Gram. Ic. t. 336.

S. longer Nees in Royle Ill. Himal. Pl. 416.

S. notopogon Nees ex Steud. Syn. Pl. Glum. 373.

Vernacular names : Sabai, Sabie, Bhabar.

Description : Perennial; stems tufted, woolly at the base, 60-90 cm. high, erect, slender, sparingly branched, grooved on one side, glabrous. Leaves 30-60 cm. by 2.5-4 mm., tapering into a subpungent acumen, concave or convolute, base obtuse, fimbriate, margins scaberulous; sheaths glabrous, ligule a tuft of short hairs.

Racemes 2-4, on axillary and terminal filiform peduncles, 2.5-5 cm. long, close or distant, erect, golden or rusty-villous; joints and pedicels half as long as the lower spikelet, slender, shortly ciliate, the pedicels bearded at the base. Sessile spikelets 4 mm. long, lanceolate; callus short, hairy. Glumes 4, lower involucre glume 3 mm. long, elliptic-oblong, chartaceous, 2-3-toothed, 5-nerved, the lower part of the glume ciliate with long rufous hairs and also with a tuft of hairs at the middle of the lower part of the back; upper involucre glume 4 mm. long, membranous, ovate-lanceolate, 2-dentate, often mucronate between the teeth, 3-5-nerved; lower floral glume equalling the lower involucre glume, oblong, obtuse, irregularly 2-dentate, hyaline, nerveless, paleate, the palea a little shorter than the glume, linear, 2-dentate; upper floral glume 3 mm. long, linear, hyaline, usually 2-dentate, but sometimes only acute at the apex, palea shorter than the glume, awn reaching 1 cm. long. Pedicellate spikelets like the sessile.

Locality : Kathnawar : Rajkot (Woodrow).

Konkan : Bombay, Victoria Gardens (McCann 4302 !).

Deccan : Poona, College Garden (Garade !); cultivated at Poona (Woodrow).

Ecology : Propagated by division of root and by seeds; thrives on coarse sandy soil.

Distribution : Afghanistan, India, China, Philippines.

Economic uses : Can be used for paper-making, strings, ropes and mats. Cattle do not eat it.

Explanation of Plate 16 : *Pollinidium binatum* (Retz) C. E. Hubbard.

- | | |
|---|---------------------|
| 1. Spikelets | } Sessile spikelet. |
| 2. Lower invol glume, ventral view. | |
| 3. Dorsal view of lower invol glume. | |
| 4. Dorsal view of upper invol glume. | |
| 5. Lower floral glume. | |
| 6. Palea of lower floral glume. | |
| 7. Upper floral glume. | |
| 8. Palea of upper floral glume with styles. | |

9. POGONATHERUM P. Beauv.

Delicate perennial grasses; stems leafy upwards, branching. Leaves narrow, suberect.

Racemes solitary on long flexuous peduncles, plumose from the slender awns; rachis at length fragile; internodes short. Spikelets very small, subterete, 2-nate, 1-2-flowered, a sessile 2-sexual, and a pedicellate male or neuter (rarely 2-sexual); callus bearded with fine hairs. Glumes 3 or 4, all membranous and hyaline, obscurely nerved or nerveless; lower involucre glume oblong, truncate, dorsally rounded; upper involucre glume longer, ovate,

keeled, 2-fid and awned in the sinus, the awn much longer than the spikelet, slightly twisted; lower floral glume nearly as long as the upper involucrel glume, not awned, usually absent from the pedicellate spikelet; upper floral glume about half as long as the upper involucrel glume, 2-fid and awned in the sinus like the upper involucrel glume, palea broadly oblong, not keeled. Lodicules obsolete. Stamens 1 or 2; anthers long. Ovary narrow; styles short, free; stigmas very long, exserted at the top of the spikelet. Grain narrow, oblong, free.

Species 2 or 3.—From India to Japan.

- | | | | |
|--|---|---|------------------------------|
| 1. Hairs of callus longer than the spikelet | . | . | 1. <i>P. crinitum</i> . |
| 2. Hairs of callus shorter than the spikelet | . | . | 2. <i>P. saccharoideum</i> . |

1. *POGONATHERUM CRINITUM* Kunth.

Pogonatherum crinitum Kunth Enum. Pl. I (1833) 478; Lisboa Bomb. Grasses (1896) 59;

Hook f. Fl. Brit. Ind. VII (1896) 141, Cooke Fl. Bomb. II (1908) 965.

P. saccharoideum var. *monandrum* Hack. Monogr. Androp. (1889) 193.

P. polystachyum Kunth Rev. Gram. (1829) 493 (*partim*) t. 161.

P. refractum Nees in Hook. & Arn. Bot. Beech. Voy. 239.

Pollinia monandra Spreng. Syst. I (1825) 288.

Pogonopsis tenera Presl. Rel. Haenk. I (1830) 133, t. 46.

Homophlus crinita Trin. Fund. Agrost. (1820) 166.

Ischaemum crinitum Trin. in Mem. Acad. Petersb. ser. 6, II (1833) 298.

Andropogon crinitus Thunb. Fl. Jap. (1784) 40, t. 7.

A. monandrus Roxb. Fl. Ind. I (1832) 260.

Pogonatherum Griff. Notul. III, 81, Ic. Pl. Asiat. t. 145, f. 2.

Description: Stems 15-30 cm. long, densely tufted. Leaves 2.5-7.5 cm. by 2.5-5 mm., linear-lanceolate, acuminate, more or less hairy; sheaths lax, glabrous with a hairy mouth; ligule of long hairs.

Racemes terminating the branches of the stem, 2-2.5 cm. long, rhachis slender, internodes short, ciliate; tips thickened, truncate. Spikelets 2-2.5 mm. long, usually monandrous; hairs of callus longer than the spikelets. Glumes nerveless, hyaline, lower involucrel glume oblong, dorsally rounded, ciliate at the rounded or retuse tip; upper involucrel glume longer than the lower, ovate, keeled, 2-fid, the lobes ciliolate, awned in the sinus with a long capillary awn 13 mm. long or more, lower floral glume linear, nearly as long as the upper involucrel glume, not awned, sometimes absent, upper floral glume cleft to the middle into 2 ciliate lobes; awn straight or recurved, 2 cm. long.

Locality: *N. Kanara* Sursi (Gammie!), Sampkhand, in a cutting (McCann 9947!, Woodrow!); Nilkund Ghat, on steep bank along roadside (Talbot 781!), Gersoppa Falls (Talbot 2671!, McCann 9939!). Often cultivated in gardens as an ornamental plant.

Ecology: Grows only in tufts in deep forest tracks along banks and rocks in streams and rivers; usually shaded.

Distribution: More or less all over India, Afghanistan, China, Malaya, New Hebrides.

*2. *POGONATHERUM SACCHAROIDEUM* P. Beauv.

Pogonatherum saccharoideum P. Beauv. Agrost. (1812) 56, t. 11, f. 7; Duthie Grasses N. W. Ind. (1888) 16, Fodder Grasses N. Ind. (1888) 27.

P. saccharoideum var. *genunum* Hack. Monogr. Androp. (1889) 193.

P. polystachyum Roem. & Schult. Syst. II, 497.

Pollinia polystachya Spreng. Syst. I, 288, Kunth Rev. Gram. (1829) 493, t. 162.

Perotis polystachya Willd. Sp. Pl. I, 324.

Saccharum panicum Lam. Encycl. I, 595, Illustr. t. 40, f. 31.

Vernacular name: Bamboo Grass.

Description: A much tufted, branched and very leafy elegant grass, 30-60 cm. high; stem firm or almost woody, slender, polished, from a perennial woodstock; nodes on stem glabrous or bearded. Leaves 2.5-6.5 cm. long, up to 2.5 mm. broad, linear, acuminate, bearded at the base and margins of sheaths.

Spikes 1-7.5 cm. long, terminating all the branches; rhachis compressed and pedicel bearded; each spikelet with 2 long fine scaberulous awns 15-25 mm. long. Sessile spikelet: lower involucrel glume narrow-oblong, broadest above, faintly 2-4-nerved, tip bearded. Upper involucrel glume the largest, conduplicate, 2.5 mm. long, 1-nerved, keel produced into a long awn, tip densely ciliate. Lower floral glume sometimes absent. Palea of upper floral glume

broadly ovate-oblong, much exceeding the minute ovary. Pedicelled spikelet about $\frac{2}{3}$ the length of the sessile.

Locality : Grown in gardens

Distribution : Hilly parts of India from the Punjab to Bhutan, Burma and China, southwards to Central India and Ceylon, Malaya.

10. APOCOPIS NEES.

Annual or perennial grasses, stems slender. Leaves narrow, flat.

Racemes solitary or 2-3-nate, compressed, rachis firm, not readily disarticulating; internodes very short, slender, villous. Spikelets secund, closely imbricating in 2 series, solitary, sessile, 1-2-flowered, the lowest 2-4 in each raceme imperfect, neuter, callus very short, acute, bearing the long capillary ciliate pedicel of an obsolete upper spikelet. Glumes 4; lower involucre glume very large, cuneately obovate or orbiculate, chartaceous below, membranous above, more or less villous with pale brown or yellow hairs, 7-9-nerved below the apex, margins incurved at the base only, upper involucre glume as long as the lower, much narrower, membranous, oblong-ovate, truncate, 3-nerved, the sides broadly incurved; lower floral glume and its hyaline palea oblong, the tips broadly truncate and ciliate, male or empty; upper floral glume 2-sexual, linear, 2-dentate, 1-nerved, hyaline, paleate, awned; palea half as long as the glume, quadrately oblong, nerveless, truncate with ciliate tip; awn short, very slender, twisted. Lodicules 0. Stamens 2 or 3, anthers linear. Ovary narrow; stigmas slender, exserted at the top of the spikelet. Grain small, narrowly oblong.

Species 8.—Indo-Malaya, China.

1. APOCOPIS VAGINATUS HACK

PLATE 17.

Apocopsis vaginatus Hack. in Oestr. Bot. Zeitschr. 41 (1891) 8; Cooke Fl. Bomb. II (1908) 967.

A. Wightii var *vaginatus* Hook. f. Fl. Brit. Ind. VII (1896) 143.

Etymology : *Apocopsis* is incorrectly formed from the Greek *apocopto*, to cut off, referring to the truncate glumes.—*Vaginatus* means sheathed.

Description : A low decumbent annual; stems much branched from the base, 7.5-20 cm. long. Leaves 2-4.5 cm. by 2-3 mm., linear, acute, shorter upwards, hairy from tubercular bases; sheaths lax, longer than the internodes, hairy at the mouth, ligule a small membrane.

Racemes 2-nate, 19-22 mm. long, closely appressed together, partly or almost entirely enclosed during flowering in the sheaths of the upper leaves, supported by a short common peduncle, more or less hairy with yellowish brown hairs, joints much shorter than the spikelets, ciliate. Spikelets oblong, 5 mm. long, brown, nearly uniform in colour; callus very short, hairy with long brown hairs. Glumes 4, lower involucre glume 4 mm. long, membranous, obovate, truncate or emarginate at the ciliate hyaline apex, densely brown hairy in the lower half, 7-9-nerved, the nerves abruptly ceasing below the apex, upper involucre glume as long as the lower, quadrate-oblong, truncate at the hyaline margin, hairy in the lower half, 3-nerved, finely ciliate at the apex, lower floral glume 4 mm. long, hyaline, linear-oblong, obtuse, ciliate at the apex, nerveless; upper floral glume 5 mm. long, conspicuously exceeding the other glumes, linear, membranous, truncate and shortly 2-dentate at the apex, awned; awn perfect, 22-32 mm. long.

Locality : Gujarat : Ahmedabad, field (Sedgwick!).

Konkan . Kalyan (Woodrow).

S. M. Country : Forests W. of Dharwar (Sedgwick!).

N. Kanara (Woodrow), Halyal (Talbot 2379!).

Ecology : A subgregarious grass. Very abundant in pastures and forest clearings in the Mallad tract of the Carnatic.

Distribution : Bihar, Central India, Deccan and W. Peninsula, Burma, Ceylon.

Explanation of Plate 17: *Apocopsis vaginatus* Hack.

1. Spikelet

2. Lower invol. glume.

3. Upper invol. glume

4. Lower floral glume.

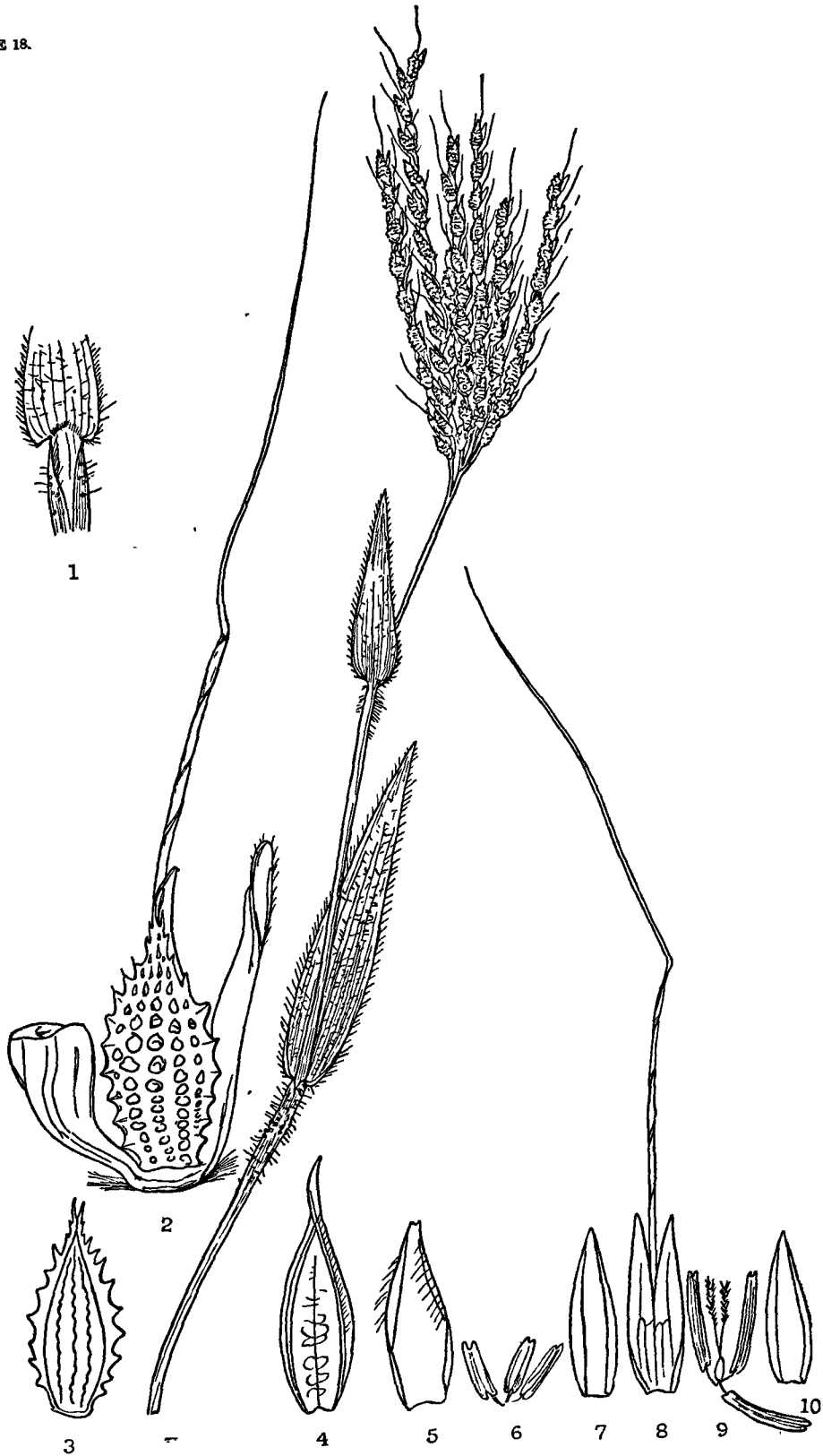
5. Upper floral glume.

6. Palea of upper floral glume.



APOCOPIS VAGINATUS HACK

Desn: R. K. Bhide.



THELEPOGON ELEGANS ROTH.

11. THELEPOGON Roth.

A coarse perennial grass. Leaves lanceolate, cordate, amplexicaul.

Racemes few or many, corymbosely fasciated, pedunculate; rhachis flexuous, fragile, the joints more or less deeply excavated. Spikelets ovoid, acute, solitary at the joints, the upper spikelet reduced to a mere almost glume-like rigid pedicel, the lower sessile, 2-flowered, the lower flower male, the upper 2-sexual. Glumes 4, lower involucrel glume coriaceous, transversely rugose, ridged or tuberculate, upper involucrel glume chartaceous, not keeled, sunk in the cavity of the joint, rigid, sparingly tuberculate, lower floral glume shorter, paleate, usually male, triandrous, with a similar palea, upper floral glume hyaline, 2-cleft, with a long twisted awn in the sinus, 3-nerved, palea narrow, equalling the glume. Lodicules cuneate, truncate. Stamens 3, anthers long. Styles free, stigmas short.

Species 1.—India and tropical Africa.

1 THELEPOGON ELEGANS Roth.

PLATE 18.

Thelepodon elegans Roth ex Roem. & Schult. Syst. II, 788 et Nov. Pl. Sp. (1821) 62, Hack.

Monogr. Androp. (1889) 267; Lisboa Bomb. Grasses (1896) 61; Hook. f. Fl. Brit. Ind.

VII (1896) 148, Cooke Fl. Bomb. II (1908) 671.

Andropogon princeps A. Rich. Tent. Fl. Abyss. II (1851) 470, t. 102.

Rhynchachne princeps Hochst. ex Steud. Syn. Pl. Glum. I (1855) 360

Jardinea abyssinica Steud. l. c.

Rhynchachne princeps Durand & Schinz. Consp. Fl. Afr. V (1898) 700.

Vernacular names : Tirpha, Kadi

Etymology : *Thelepodon* is derived from *thele*, a teat, and *pogon*, a beard.

Description : Annual. Culms somewhat stout, erect from a geniculate and frequently rooting base, up to over 60 cm. high, 6-9-noded, terete, smooth or more or less rough towards the inflorescence, simple or branched. Leaf-sheaths loose, prominently striate, glabrous or more or less hirsute with tubercle-based hairs and ciliate along the outer margin; ligules ciliate, blades lanceolate to linear-lanceolate, from a broad and often amplexicaul cordate base, up to 25 cm. by over 2.5 cm., flat, somewhat flaccid, glaucescent, glabrous and smooth, excepting the spinulose-ciliate margins or more or less scabrid from short tubercle-based hairs, midrib whitish above, primary lateral nerves 5-7 on each side, fine.

Racemes pale green, from 5-15 cm. long, 2-12, if many the lowest verticillate, simple or divided, the following 13-25 mm. higher up from the common rhachis, all with scabrid or hispidulous peduncles up to 2.5 cm. long; joints 6-9.5 mm. long, with several green scabrid nerves on the back and straight tips, pedicels linear, obtuse, somewhat longer than the spikelet, flat, scabrid on the back and the margins, slightly curved, contiguous with the apex of the joint, enclosing with it a lanceolate space exposing the back of the upper involucrel glume. Spikelets with a short annuliform ciliate callus, 5-7 mm. long, ovate-oblong. Involucrel glumes subequal; lower subacuminate, minutely 2-toothed, transverse rugae interrupted, most prominent towards the edge, nerves about 9, green, distinct in transmitted light, the inner 4 or 5 not reaching the tip, upper involucrel glume slightly exceeding the lower, acuminate, with the acumen keeled and scabrid, 3-nerved. Lower floret male: floral glume hyaline, slightly shorter than the lower involucrel glume, broad-lanceolate, 2-nerved, glabrous, with a similar but narrow palea. Upper floret hermaphrodite: floral glume as long as that of the lower floret, 2-fid to the middle, broad, quadrate-obovate, below the sinus, glabrous, lobes lanceolate, acute; awn up to 2.5 cm. long, slender, kneeled at and twisted below the middle, column dark brown, bristle yellowish. Anthers over 2 mm. long. Stigmas purple, up to 3 mm. long. Grain deep purple.

Locality : Gujarat. Kaira (ex Burns); Ahmedabad (Sedgwick l.).

Konkan : Thana (ex Burns).

W. Ghats : Matheran (D'Almeida A257 l.); Panchgani (Blatter & Hallberg B1267 l.).

Deccan : Najar to Pasur Rd. (Paranjpye l.), Lana Hill, Nasik Dist. (Blatter & Hallberg A79 l. 4544 l.); Katraj Ghat (Gammue l.); Barrawadi, Purandhar (McCann 5053 l.); Poona (Woodrow); Hewra (Dalzell); near Nasik (Edgeworth); Ahmednagar (ex Burns).

S. M. Country : Dharwar (Sedgwick 1824 l.); Alnavar (Talbot 2303 l.), Belgaum (Ritchie 812).

N. Kanara : Halyal (Talbot 2094 l. 2142 l.).

Ecology : A subreganous grass. Very abundant on banks between ricefields in the Malled tract of the Carnatic. It forms the principal constituent of monsoon headloads of grass at Dharwar. It often grows on the sides of roads.

Distribution : Central India, W. Peninsula, tropical Africa.

Economic uses : According to Dalziel eaten by horses, although very bitter.

Explanation of Plate 18 : *Thelepogon elegans* Roth.

- | | |
|---|---------------------|
| 1. Ligule. | |
| 2. Sessile spikelet with joint of rachis. | |
| 3. Lower invol. glume. | } Sessile spikelet. |
| 4. Upper invol. glume | |
| 5. Lower floral glume. | |
| 6. Stamens | |
| 7. Palea of lower floral glume | |
| 8. Upper floral glume. | |
| 9. Stamens and styles. | |
| 10. Palea of upper floral glume. | |

12. LOPHOPOGON Hack.

Small perennial densely tufted grasses. Leaves very narrow.

Spikes short, solitary, 2-nate or fasciculate at the ends of capillary branches, fragile. Spikelets usually 2-nate at each node of the rachis; the upper shortly or very shortly pedicellate, 1-2-flowered, aristate from the upper floral glume, the lower spikelet sessile, 2-flowered, not awned from the upper floral glume; lower involucre glume of both spikelets 3-4-dentate, 5-7-nerved, upper involucre glume of same 2-dentate, aristate between the teeth; lower floral glume narrow, hyaline, empty or male, upper floral glume hyaline or membranous, that of the upper spikelet with a long awn, that of the lower spikelet awnless. Lodicules 0. Stamens 2. Styles very short, stigmas exerted from the apex of the spikelet

Species 3 — Indo-Malaya, Australia.

1. LOPHOPOGON TRIDENTATUS Hack.

PLATE 19.

Lophopogon tridentatus Hack in Engl. & Prantl Pflanzenf. II, pt. II (1887) 22, 26; Monogr.

Androp (1889) 254, t. 1, fig 14; Hook f. Fl. Brit. Ind. VII (1896) 149; Lisboa Bomb.

Grasses (1896) 61; Cooke Fl. Bomb. II (1908) 966

Andropogon tridentatus Roxb. Fl. Ind. I (1832) 257.

Saccharum tridentatum Spreng. Syst. I (1825) 283.

Etymology : *Lophopogon* is derived from *lophos*, a crest, and *pogon*, a beard, referring to the upper involucre glume which is hirsute and aristate near the apex. *Tridentatus* means 3-toothed, alluding to the lower involucre glume.

Description : Perennial, stems tufted, 10-20 cm. high, erect, slender, terete, glabrous. Leaves 5-10 cm. by 1-1.5 mm., linear, acuminate, rigid, erect, green; sheaths close, quite glabrous, striate, shorter than the internodes, the upper ventricose; ligule very small, truncate, hyaline, ciliate.

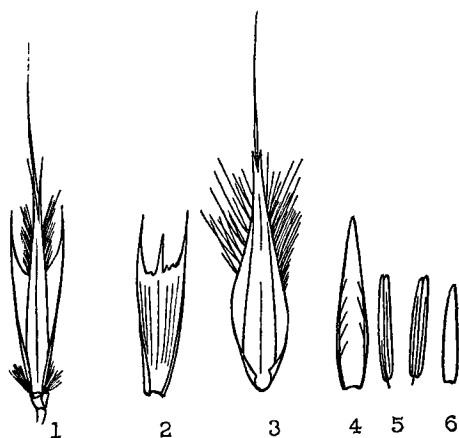
Heads of racemes erect, sheaths ovoid, flattened, membranous, caudate-acuminate. Racemes usually 2, closely appressed together, appearing like one, 13-20 mm. long, erect, pilose with golden or ferruginous hairs, the peduncle shortly exerted or more or less enclosed in the upper sheath; joints of rachis very short, slender, glabrous. Spikelets densely imbricate. Lower spikelets reaching 5 mm. long, brown when dry, obovate-oblong; callus 0.8 mm. long, obtuse, with a small tuft of ferruginous hairs at the very tip. Glumes 4, lower involucre glume chartaceous, cuneate-oblong, truncate, with 2 long lateral teeth and 1 or 2 shorter ones between, glabrous on the back, 5-nerved; upper involucre glume 5 mm. long, membranous, lanceolate, acute, 3-nerved, hirsute near the apex with ferruginous hairs, and sending out an awn as long as the glume, lower floral glume 4 mm. long, narrowly linear, subacute, hyaline, nerveless, glabrous, epaleate, upper floral glume 4 mm. long, lanceolate, entire or 2-fid, hyaline, not awned. Upper spikelets very shortly pedicellate; lower involucre glume membranous, 3-toothed, clothed with tufts of long bristles below the middle; upper floral glume with a long awn 2 cm. long, geniculate about the middle, the column brown, twisted.

Locality : *Khandesh :* Tapti, Bhusawal (Blatter & Hallberg 5457 !).

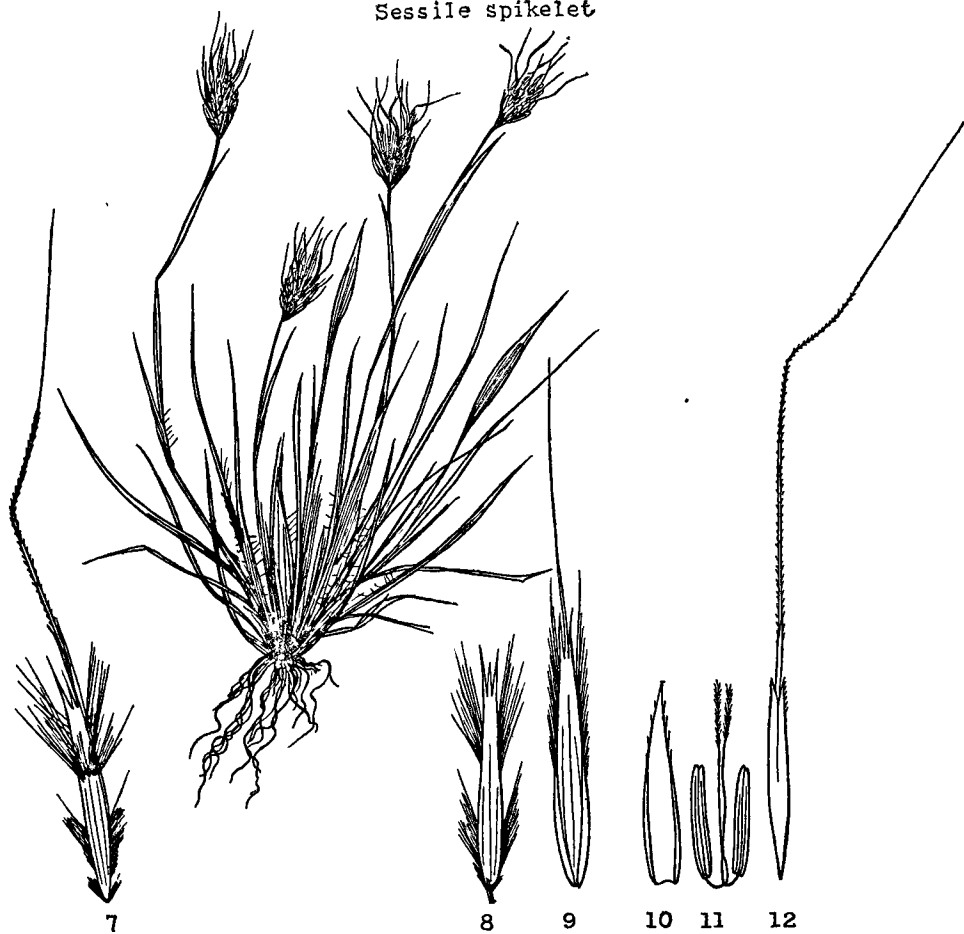
W. Ghats : Igatpuri (McCann 4572 !).

Deccan : Kurkee, Agricultural College compound (Bhide !); Bapodh, near Poona (Gammie 15315 !); Bowadhar, near Poona (Garade !); Rahuri (Nana A80 !); Chatter-shinji Hill, Poona (Ezekiel !); Deolali (Blatter 9610 & 9620 !); Jeur, Sholapur Dist. (Woodrow !).

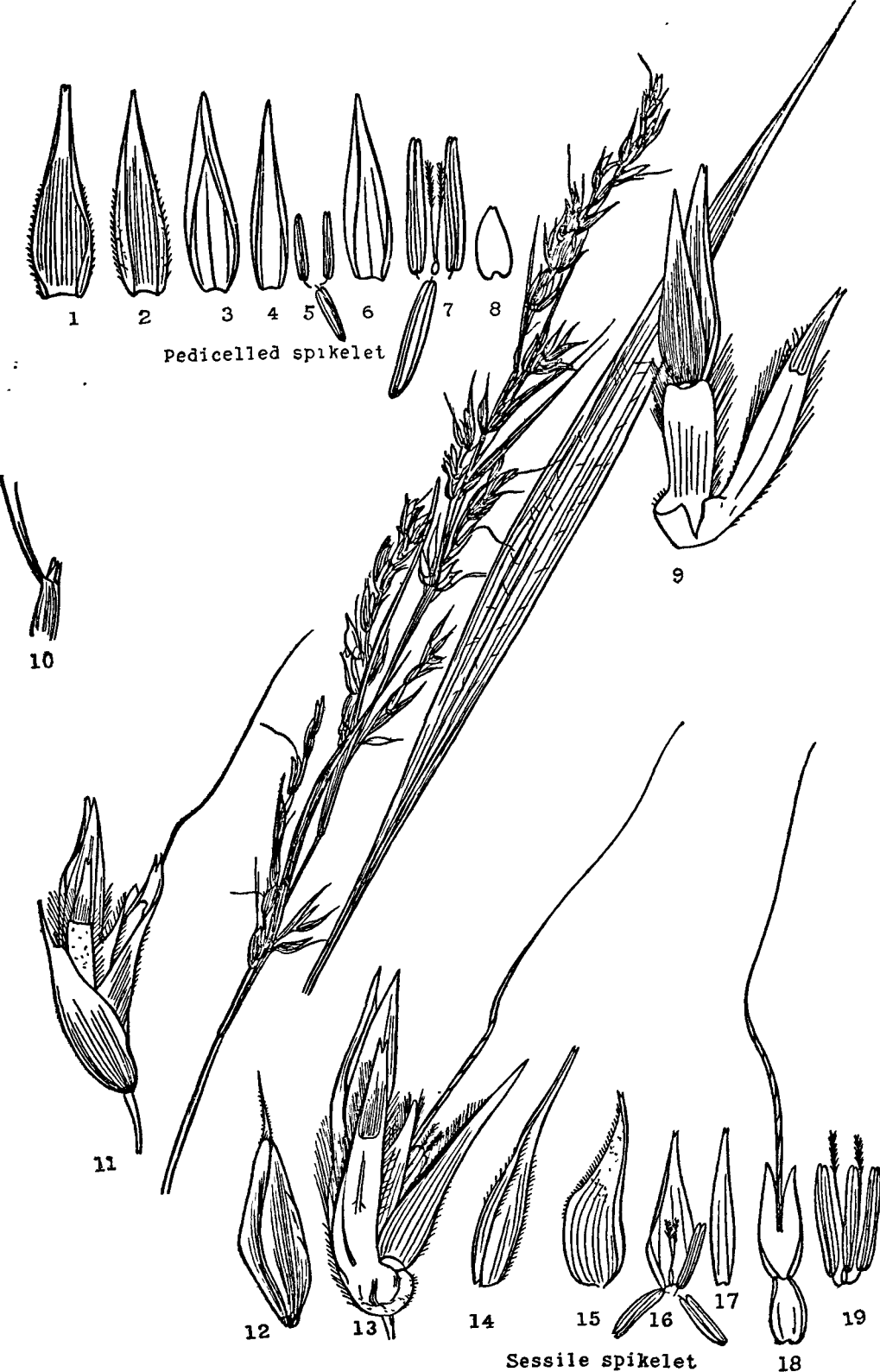
S. M. Country : Dharwar, on dry gravelly uplands, 2,400 ft., rainfall 34 in. (Sedgwick 3010 !).



Sessile spikelet



Pedicelled spikelet



APLUDA VARIA HACK, VAR ARISTATA HACK

Del. P. K. R.

Ecology : Grows sporadically. Common in the Dharwar neighbourhood on arid uplands. Flowering only in the late monsoon months, October-November.

Distribution : Central Provinces, W. Peninsula.

Explanation of Plate 19 : *Lophopogon tridentatus* Hack.

- | | |
|-------------------------|------------------------|
| 1. Spikelet. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume | |
| 4. Lower floral glume. | |
| 5. Stamens. | |
| 6. Upper floral glume. | |
| 7. Spikelets. | } Pedicelled spikelet. |
| 8. Lower invol. glume. | |
| 9. Upper invol. glume | |
| 10. Lower floral glume | |
| 11. Stamens and styles | |
| 12. Upper floral glume. | |

13. *APLUDA* Linn.

A tall slender perennial leafy grass, stems erect or subscandent, branching. Leaves narrow, flat, more or less petiolate

Inflorescence paniculate, leafy, of small spikes each in a spathiform bract. Spikes deformed, base rounded, often utricular, bearing in front a sessile 2-sexual spikelet, prolonged above the base into 2 flat linear truncate parallel arms, one terminated by a solitary minute glume, the other by the upper spikelet. Glumes of both spikelets 4, the involueral glumes empty, the floral glumes delicately membranous. Lower spikelets: lower involueral glume longest, antecus, linear-oblong, coriaceous, rigid, upper involueral glume thinner, tumid, beaked, dorsally gibbous, 7-nerved, lower floral glume oblong, acute, 3-nerved, triandrous or neuter, with a linear 2-nerved palea, upper floral glume short, quadrate, deeply 2-fid, awned in the sinus, female or 2-sexual, with a minute ovate palea. Styles short, free, stigmas short, pectinate. Upper spikelets dorsally compressed, lower involueral glume oblong, acute, many-nerved, herbaceous, the margins narrowly incurved, upper involueral glume chartaceous, ovate-lanceolate, acuminate, 3-nerved, lower floral glume oblong, 1-nerved, triandrous, upper floral glume oblong, 1-nerved, female or imperfectly 2-sexual, paleae of both floral glumes as in the lower spikelets. Lodicules of all flowers 2, cuneate. Anthers linear. Grain oblong, subcompressed.

Species 1.—Tropical Asia to New Caledonia, tropical Arabia and Socotra.

1. *APLUDA VARIA* Hack *VAR. ARISTATA* Hack

PLATE 20.

Apluda varia Hack. in Monogr. Androp. (1839) 196, *var aristata* Hack. l. c., Hook. f. Fl. Brit. Ind. VII (1896) 150, Stapf Fl. Trop. Afr. IX (1917) 40

A. aristata Linn. Cent. II, 71, Schreber Besch. d. Graes. 93, t. 42, P. Beauv. Agrost. (1812) 133, Steud. Syn. Pl. Glum. I (1853) 403, Roxb. Fl. Ind. I (1832) 324; Dalz. & Gibs. Bomb. Fl. (1861) 303; Duthie Fodder Grasses N. Ind. (1888) 44, t. 29

A. Gryllus P. Beauv. Agrost., Expl. planches 15, t. 23, fig. 5 (6 *per errorem*).

Vernacular names : Phulse, Tulsi, Paodi, Khavas, Bhuchusa, Makka, Bhas, Phulaer, Pookli, Pokli, Kurda, Chickwar, Tambat, Tambita, Kharwel

Etymology : *Apluda* means chaff—*Varia* refers to the great variability of the species.

Description : Mostly annual, branched from the base. Culms erect, 30-180 cm. high, or geniculate ascending and often rooting from the nodes, many-noded, terete, smooth and glabrous. Leaf-sheaths terete, tight and glabrous or very rarely sparingly hairy, those supporting the flowering branches wider and shorter with reduced blades; ligules short, rounded off, glabrous or ciliate; blades linear-lanceolate, long-attenuated towards the base, almost petiolate, tapering upwards to a fine setaceous point, up to over 30 cm. long, 5-15 mm. wide, convolute in bud, then flat, somewhat rigid or flaccid, glaucous below, glabrous or very rarely sparingly hairy, slightly rough above, scabrid along the margins, midrib white above, stouter towards the base, primary lateral nerves 5-8 on each side, fine.

Panicle up to 60 cm. long, much compound, primary branches long, those of the following orders gradually shorter, bearing clusters of trios of spikelets, spathe at the base of the trios ovate to ovate-oblong, mucronate or bearing rudimentary blades, glabrous, green or tinged with purple, 5-6.5 mm. long; bulbous basal joint up to 2 mm. long, whitish. Sessile

spikelet lanceolate-oblong, acute, up to 6 mm. long. Lower involucrel glume chartaceous, firmer below, many-nerved; upper somewhat gibbous on the back, scaberulous on the keel. Lower floret floral glume oblong-lanceolate, acute, slightly shorter than the involucrel glumes, 3-nerved, glabrous, palea linear-lanceolate, almost as long as the floral glume, 2-nerved. Upper floret: floral glume 4 mm. long, 2-fid to beyond the middle, awn up to 13 mm. long, very fine, with or without a distinct twisted column; palea generally much shorter, oblong to broad-ovate, nerveless. Anthers 3.2-4.2 mm. long. Stigmas purple, up to 6.3 mm. long. Grain over 1 mm. long. Pedicels 3.2-4.2 mm. long, sparingly ciliate. Lateral pedicelled spikelet 5.2-5.8 mm. long. Involucrel glumes similar, subherbaceous, lanceolate, acute, many-nerved; lower involucrel glume rather flat on the back, upper not or obscurely keeled and not gibbous. Florets as in the sessile spikelet, but the upper not awned, both male or more or less reduced. Terminal spikelet reduced to a short striate involucrel-glume, continuing the pedicel.

Locality : *Cutch*. Kala Pacham Isl. (Blatter 3735 !); Karu Roa (Blatter 3776 !).

Gujarat. Broach (Chibber !); Nadiad Farm (Herb. Econ. Bot. Poona !); Surat (Gammie 16467 !, Cooke); Garvi Dangs (Sedgwick !); Ahmedabad (Cooke).

Khandesh: Muravat, Tapti bank (Blatter & Hallberg 4434 !); N. slope of Chanseli Hill (McCann A83 !); Toranmal (McCann A84 !); Munmad, Ankai Hill (Blatter A146 !).

Konkan. Extremely common throughout the islands of Bombay and Salsette (McCann !); Bassein (McCann 4480 !); Alibag, margin of water works (Ezekiel !); Daph forest (Ryan !).

W. Ghats. Khandala, very common (McCann 5294 !); Igatpuri, very common (McCann 4325 ! 4324 !); Panchgani (Blatter 5385 !, Bhide !, Blatter & Hallberg B1322 !); Londa (Gammie 15861 !).

Deccan: Purandhar (McCann 5008 !, Bhide !); Diva Ghat (McCann A86 !); Sholapur (D'Almeida A87 !).

S. M. Country: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4489 !); Belgaum (Ritchie 824).

N. Kanara: Halyal (Talbot 2495 !); Jugglepet (Talbot !); Kawarwad (Talbot 2246 !).

Ecology : Commonly found in hedges and amongst bushes. In these localities it often becomes elongated and assumes a climbing habit. One of the commonest forest grasses but also found outside forest tracts. Purely a monsoon species, but the dry plants remain erect for a considerable time after the monsoon.

Distribution : Socotra, India, Ceylon, E. tropical Asia, Malaya, Australia, Pacific Islands.

Economic uses : In some districts it is considered to be a good fodder, especially for buffaloes when young and green. It, however, breaks down easily when tall and is, therefore, not fit for cutting and stacking (Lusboa).

Explanation of Plate 20 : *Apluda varia* Hack. var. *aristata* Hack.

- | | | |
|---|---|----------------------|
| 1. Lower invol. glume. | } | Pedicelled spikelet. |
| 2. Upper invol. glume. | | |
| 3. Lower floral glume. | | |
| 4. Palea of lower floral glume. | | |
| 5. Stamens. | | |
| 6. Upper floral glume. | | |
| 7. Stamens and styles. | | |
| 8. Palea of upper floral glume. | | |
| 9. Spikelet. | | |
| 10. Ligule. | } | Sessile spikelet. |
| 11. Spikelets. | | |
| 12. Bract. | | |
| 13. Spikelets. | | |
| 14. Lower invol. glume. | | |
| 15. Upper invol. glume. | | |
| 16. Lower floral glume, anthers and styles. | | |
| 17. Palea of lower floral glume. | | |
| 18. Upper floral glume and palea. | | |
| 19. Stamens and styles. | | |

14. HEMARTHRIA R. Br.

Decumbent or ascending perennial grasses with many-noded branched compound culms; blades linear, conduplicate in bud, then flat; ligules very short, membranous.

Racemes compressed, often curved, tips more or less subulate owing to the slender terminal spikelet; spikelets pseudo-opposite owing to the fusion of joints and pedicels, each pair made up of a sessile (secondary) spikelet and the pedicelled companion of the sessile spikelet of the next lower node. Spikelets 2-nate on the tough or tardily disarticulating rhachis of spike-like spathe-supported racemes which terminate the culms and their often fascioled branches, alike in sex and shape, or at least similar; joints and pedicels fused into roughly semicylindric internodes, hollowed out on the inner face for the reception of the sessile spikelet; disarticulation at a right angle to the rhachis or slightly oblique, tips of joints truncate, not hollowed out or appendaged. Sessile spikelet. Florets 2, lower reduced to a barren floral glume, upper hermaphrodite, awnless. Involucral glumes equal or subequal, lower flat on the back, 2-keeled, very narrowly inflexed along the margins, coriaceous or subcoriaceous, closing up the cavity formed by the adjacent joint and pedicel, upper membranous adhering to the inner face of the cavity. Floral glumes hyaline, of lower floret 2-nerved, of upper usually nerveless. Palea (of upper floret) hyaline, small, nerveless. Lodicules 2, cuneate. Stamens 3. Stigmas laterally exerted. Grain oblong, dorsally slightly compressed, embryo about two-thirds the length of the grain, hilum conspicuous, punctiform, subbasal. Pedicelled spikelet with more elongated acuminate involucral glumes, particularly the terminal, the upper involucral glume mucronate or aristate.

Species about 8.—Throughout the warm countries of the Old World, 1 also in America, but probably introduced.

1. *HEMARTHRIA COMPRESSA* (Linn. f.) R. Br.

PLATE 21.

Hemarthria compressa (Linn. f.) R. Br. Prodr. Nov. Holl. (1810) 207.

H. coromandelina Steud. Syn. I (1855) 358.

Rotboellia compressa Linn. f. Suppl. (1781) 114; Lisboa Bomb. Grasses (1896) 56, Hook. f.

Fl. Brit. Ind. VII (1896) 153 (*partim*); Cooke Fl. Bomb. (1908) 952.

R. compressa var. *genuina* Hack. Monogr. Androp. (1889) 286, Hook. f. Fl. Brit. Ind. VII (1896) 153.

R. glabra Roxb. Fl. Ind. I (1832) 353.

H. compressa Kunth Enum. I, 465 (*partim*), Grah. Cat. Bomb. Pl. (1839) 233; Duthie Grasses N. Ind. (1883) 18, Fodder Grasses N. Ind. (1888) 30.

Vernacular name : Baika

Description : Perennial, stems erect from a decumbent rooting base, 60-150 cm long (according to Roxburgh scandent and reaching 6 m. long), branched, compressed, glabrous, striate, leafy. Leaves 2.5-12.5 cm by 3-5 mm, linear, acuminate, flat, glabrous, base rounded, margins scabrid, sheaths shorter than the internodes, compressed, loose, glabrous, ligule short, membranous, ciliate.

Racemes few or many, often fascioled, 5-12.5 cm long, erect, straight or curved, herbaceous, dark green, rhachis almost articulate, internodes broad, striate, glabrous, nearly as long as the glabrous spikelets. Sessile spikelets 4-5 mm long; callus small, naked. Glumes 4; lower involucral glume coriaceous, bluntly acuminate, the tip often shortly membranous, 7-9-nerved, upper involucral glume as long as the lower, linear-oblong, acutely acuminate, membranous, 3-nerved, adhering to the cavity of the internode, floral glumes subequal, 4 mm. long, lanceolate, acute, nerveless, hyaline; palea linear, 2-5 mm. long. Pedicellate spikelets rather longer and narrower than the sessile; lower involucral glume acutely acuminate; upper involucral glume chartaceous, 5-7-nerved, floral glumes as in the sessile spikelets.

Locality : Sind : Bugar, Indus River (Blatter & McCann D661 !); Mirpur Sakro (Blatter & McCann D662 !).

Gujarat : Kankaria Tank, Ahmedabad (Sedgwick !).

Khandesh : Tapti, Bhusawal N. E. (Blatter & Hallberg 5495 !).

N. Kanara : Sirsi to Siddhapur (Hallberg & McCann A78 !).

We have not included the localities mentioned by Cooke Fl. Bomb. II, 952 as some of his specimens might belong to another species.

Ecology : Found in pasture lands, borders of ricefields, and other moist places. A hygrophilous species.

Distribution : Throughout the hotter parts of India, Ceylon, most warm countries.

Economic uses : Cattle like it.

Explanation of Plate 21 : *Hemarthria compressa* (Linn. f.) R. Br.

- | | |
|----------------------------------|------------------------|
| 1. Part of spike. | |
| 2. Ligule. | |
| 3. Lower invol. glume. | |
| 4. Upper invol. glume. | } Sessile spikelet. |
| 5. Lower floral glume. | |
| 6. Upper floral glume. | |
| 7. Palea of upper floral glume. | |
| 8. Grain. | |
| 9. Lower invol. glume. | |
| 10. Upper invol. glume. | |
| 11. Lower floral glume. | } Pedicelled spikelet. |
| 12. Upper floral glume. | |
| 13. Palea of upper floral glume. | |
| 14. Grain and lodicules. | |

15 *MANISURIS* Linn. f.

Annual erect slender leafy grasses. Leaves flat, cordate.

Racemes small, terete, axillary and terminal, shortly pedunculate, rhachis green, ultimately fragile, glabrous, with short broad internodes excavate opposite the sessile spikelets. Spikelets minute, in dissimilar pairs, one globose, sessile, 2-sexual, the other ovate, pedicellate, male or neuter, the pedicel adnate or closely appressed to the joint of the rhachis. Sessile spikelets: glumes 4, lower involucrel glume hard, globose, foveolate, coriaceous at length crustaceous, with an oblong opening opposite the rhachis; upper involucrel glume minute, oblong, coriaceous, 1-nerved, closing the orifice of the lower involucrel glume; lower floral glume very minute, hyaline, orbicular, empty; upper floral glume and its palea hyaline, broadly oblong. Lodicules 2, subquadrate. Anthers minute. Styles and stigmas short.

Species 1.—Throughout the tropics.

1. *MANISURIS GRANULARIS* Linn. f.

PLATE 22.

Manisuris granularis Linn. f. Nov. Gram. Gen. (1779) 40; Sw. Prodr. Veg. Ind. Occ. (1788) 25; P. Beauv. Agrost. (1812) t. XXI, fig. 10; Roxb. Pl. Corom. II, 11, t. 118, Fl. Ind. I (1832) 352; Grah. Cat. Bomb. Pl. (1839) 234; Dalz. & Gibs. Bomb. Fl. (1861) 300; Hack. Monogr. Androp. (1889) 314; Duthie Grasses N. W. Ind (1883) 18, Fodder Grasses N. Ind. (1888) 29, t. 46; Lasboia Bomb. Grasses (1896) 62; Hook. f. Fl. Brit. Ind. VII (1896) 159; Cooke Fl. Bomb. II (1908) 955; Stapf Fl. Trop. Afr. IX (1917) 57.

Cenchrus granularis Linn. Mant. II, App. 575.

Haeckelochloa granularis O Kuntze. Rev. Gen. Pl. II (1891) 776.

Rytidala granularis Skeels in U. S. Dept. Ag. Bur. Pl. Indust. Bull. 282 (1913) 20.

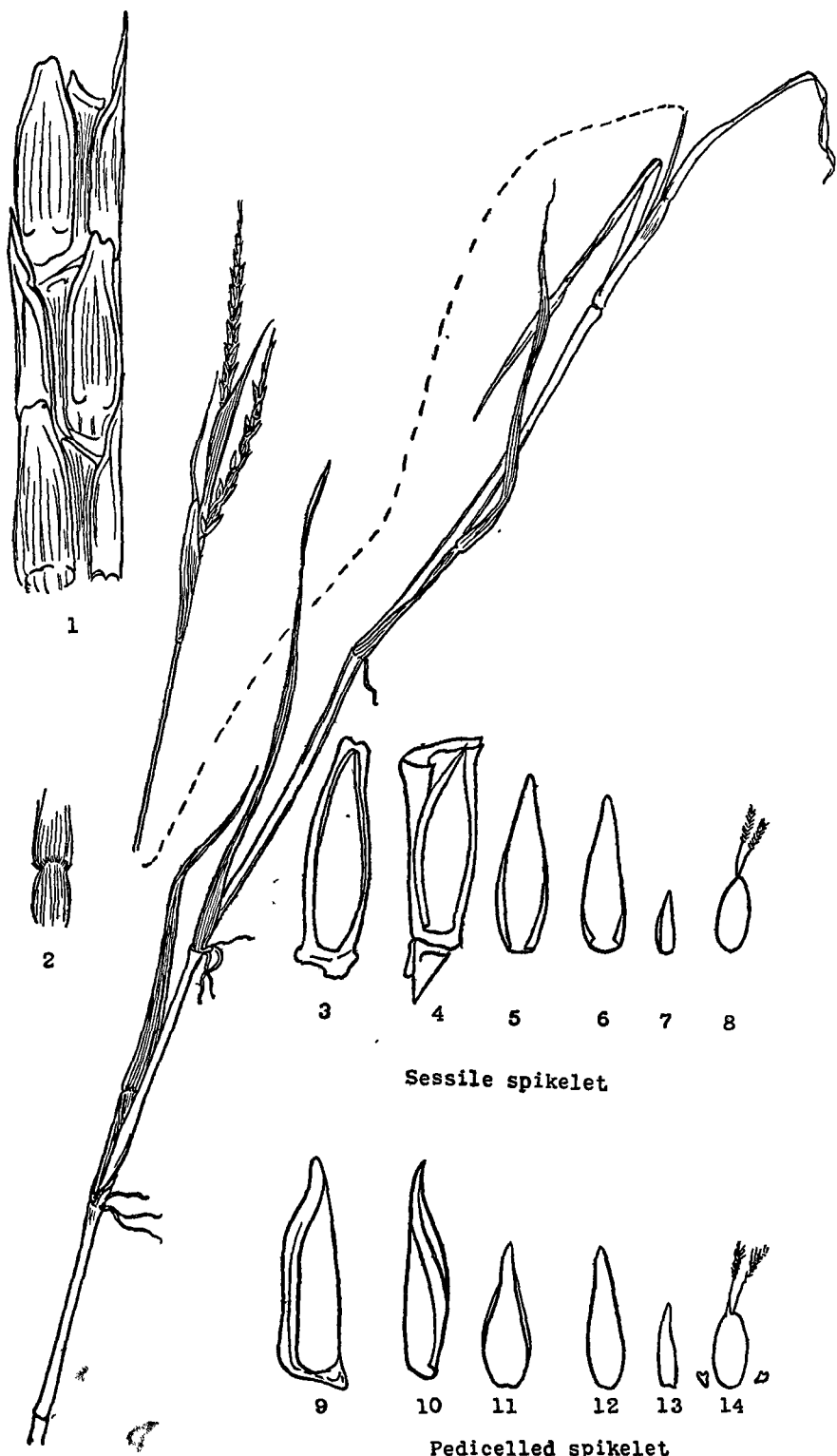
Manisuris polystachya P Beauv Fl. Owar. et Ben. t. 14.

Vernacular names : Kangri, Datura ghas.

Etymology : *Manisuris* is derived from *manus*, a scaly lizard, and *oura*, a tail, in allusion to the appearance of the foveolate and verrucose surface of the lower glume of the fertile spikelet.

Description : Stems 10-75 cm. high, slender, compressed, softly hairy, leafy; nodes hairy. Leaves 3-8-20 cm. by 6-13 mm., linear-lanceolate, acute or acuminate, flat, hairy on both surfaces or on the lower only with bulbous-based hairs, margins ciliate, base cordate; sheaths much shorter than the internodes, hispid with bulbous-based hairs; ligule very short, membranous, densely ciliate.

Racemes 6-25 mm. long, resembling a string of minute beads, solitary or seemingly fasciated in the axils of the leaves, but individually from shortened axillary branches. Sessile spikelets 1-5-2 mm. long, subglobose; callus tumid, glabrous. Glumes 4; lower involucrel glume irregularly foveolate on the back, upper involucrel glume closing the cavity of the lower floral glume, elliptic-oblong, obtuse, 1-nerved; lower floral glume hyaline, shorter than the upper involucrel glume, upper floral glume about equaling the lower, broadly ovate, obtuse; palea similar but a little shorter. Pedicellate spikelets equal in length to the sessile or longer, of 2 equal green glumes about 2.5 mm long; lower involucrel glume broadly ovate



HEMARTHRIA COMPRESSA-(LINN F) R, BR

Delin. R K Bhude



MANISURIS GRANULARIS LINN F.

Delin: B K Bhid.

or suborbicular, obtuse or subacute, 5-7-nerved, one margin narrowly folded, the other with a hyaline wing; upper involucrel glume boat-shaped, laterally compressed, the keel with a dorsal hyaline ciliate wing.

Locality : *Gujarat* . Charodi (Gammie 16534 !).

Konkan : Wada Taluka (Ryan 690 !); Mulgaum in Salsette, open grassland (McCann 3642 !).

W. Ghats . Igatpuri (McCann 4573 !); Khandala (Woodrow), behind Hotel (McCann 9410 !), behind Duke's Nose (McCann 9393 !); Panchgani, on way to Rajpuri (McCann 1752 !).

Deccan . Poona (Woodrow !, Cooke); Chhattarshingji Hill (Ezekiel !); Deolali (Blatter & Hallberg 4552 !), Kirkee to Poona, railway line (Garade 8231 !).

S. M. Country : Dharwar, 2,400 ft, rainfall 34 in. (Sedgwick & Bell 4146 !, Woodrow); Kuput Hill, Dharwar Dist. (Talbot 2323 !).

N Kanara . Halyal (Talbot 1733 ! 2385 !).

Ecology : Very common in open grassland.

Distribution : Throughout the tropics.

Economic uses : Coldstream says that it is both grazed and stacked in the Punjab, but not much relished by cattle. Said to be a good fodder grass at Ajmere.

Explanation of Plate 22 : *Mansuris granularis* Linn. f.

- | | |
|-----------------------------------|------------------------|
| 1. Part of spike. | |
| 2. Lower invol. glume. | } Pedicelled spikelet. |
| 3. Upper invol. glume. | |
| 4. Fertile spikelet. | |
| 5. Ligule. | |
| 6. Sterile spikelet. | |
| 7. Lower invol. glume. | } Sessile spikelet. |
| 8. Upper invol. glume. | |
| 9. Lower floral glume. | |
| 10. Upper floral glume and palea. | |
| 11. Stamens and styles | |

16. PELTOPHORUS Desv.

Annual or perennial short grasses with slender much-branched rarely simple culms; blades linear, narrow, conduplicate in bud, then flat, ligules short, membranous.

Racemes much compressed, rather slender, straight or curved, very conspicuously dorsiventral; spikelets pseudo-opposite owing to the fusion of joints and pedicels, each pair made up of a sessile (secondary) spikelet and the pedicelled companion of the sessile spikelet of the next lower node. Spikelets 2-nate on the more or less fragile rachis of spike-like spathe-supported racemes which terminate the culms and their branches, different in sex and shape, joints and pedicels fused into somewhat stout internodes, convex on the back, hollowed out on the inner face for the reception of the sessile spikelet, disarticulation at a right angle to the rachis, tips of internodes truncate with two concavities corresponding to the next upper sessile and the adjacent pedicelled spikelet. Sessile spikelet dorsally much compressed. Florets 2, lower male or neuter and then with or without a palea, upper hermaphrodite, awnless. Involucrel glumes equal or the upper shorter; lower coriaceous, transversely rugose or muricate, conspicuously winged from the keels, upper membranous, immersed in the cavity formed by the joint and pedicel, usually 3-nerved, keeled (often obscurely). Floral glumes hyaline, nerveless or 2-3-nerved. Palea, if present, hyaline, nerveless or 2-nerved. Lodicules 2, cuneate. Stamens 3. Stigmas linear, laterally exerted low down. Grain oblong; embryo equalling the grain. Pedicelled spikelet male or neuter. Lower involucrel glume coriaceous, smooth, asymmetrically or unilaterally winged, upper variously winged from the keel. Florets as in the sessile spikelet but male or barren.

Species 5.—Indian Peninsula (4) and tropical Africa (1).

- | | |
|---|---------------------------|
| I. Lower involucrel glume 2- aristate | 1. <i>P. divergens</i> . |
| II. Lower involucrel glume with a simple awn or acuminate. | |
| 1. Lower involucrel glume broadly ovate, acuminate (not awned) | 2. <i>P. acuminatus</i> . |
| 2. Lower involucrel glume lanceolate with a slender scabrid awn | 3. <i>P. Talboti</i> . |

1. *PELTOPHORUS DIVERGENS* (Hack.) Camus.

PLATE 23

Peltophorus divergens (Hack.) Camus in Bull. Mus. Hist. Nat. 5 (1921) 371; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 29.

Rooboellia divergens Hack. Monogr. Androp. (1889) 293; Lisboa Bomb. Grasses (1896) 57; Hook. f. Fl. Brit. Ind. VII (1896) 155; Cooke Fl. Bomb. II (1908) 953.

Vernacular names : Mareh, Marvel.

Etymology : *Peltophorus* is derived from *peltis*, a shield, and *phero*, I bear.

Description : Annual, stems 10-23 cm. high, erect or ascending, slender, nodes 2-3, all with usually 2-nate flowering branches. Leaves 5-10 cm. by 2-5-4 mm., linear, acuminate, complicate, rising without constriction from the sheath, hairy; sheaths 2-5-3-8 cm. long, shorter than the internodes, loose, hairy, ligule 2 mm. long, membranous, rounded.

Raceme 2-5-3-8 cm. long, pale yellow, simple solitary; peduncle filiform, sheathed; joints of the rachis shorter than the spikelets, subclavate, excused. Sessile spikelets 6 mm. long (excluding the awns), nearly 13 mm. long when the awns are included, 2-arristate; callus short. Glumes 4; lower involucre glume coriaceous, with 5-7 transverse echinulate ridges below the middle, the tips of the echinae curved upwards, the central portion of the glume above the echinate base ovate-lanceolate, acute, cleft at the apex, with 2 nearly semicircular equal membranous wings with thickened flattened green margins on the inner edge, which margins are prolonged into slender, slightly divergent awns; upper involucre glume much shorter, about 3 mm. long, thinly membranous, oblong, acute, 1-nerved; lower floral glume about 2-5 mm. long, broadly ovate, nerveless, empty; upper floral glume slightly shorter than the lower. Pedicellate spikelets as long as the sessile; pedicels about 2-5 mm. long, lower involucre glume chartaceous without a muricate base, winged on one side only and with 1 awn from the thickened margin of the wing, about 7-nerved, upper involucre glume with a large membranous wing on the back at the apex and an awn about 2 mm. long.

Locality : Konkan. Trombay (McCann A71 !), Kanari Caves, on open rock faces (McCann !).

W. Ghats Khandala (Woodrow), Saddle, very common all over (McCann 9616 !); Lonavla (Rhude !), Mahabaleshwar, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4560 !, Lisboa), Panchgani (Blatter & Hallberg B1252 ! B1259 ! B1263 ! B1286 !), behind the Table-land on rocks (Blatter 3805 !), Castle Rock, 1,800 ft., rainfall 300 in. (Sedgwick & Bell 4295 !).

Deccan Satara (Lisboa)

S. M. Country. Amboli Ghat (Talbot 4305 !); Belgaum (Ritchie 808, 827).

N. Kanara Karwar (Talbot 3171 !).

Ecology : Usually growing in tufts on rocks. The spikes are very brittle when dry and always fall off. Occurs on the crest of the Kanara Ghats. Begins to flower in early September.

Distribution : W. Peninsula

Explanation of Plate 23 : *Peltophorus divergens* (Hack.) Camus.

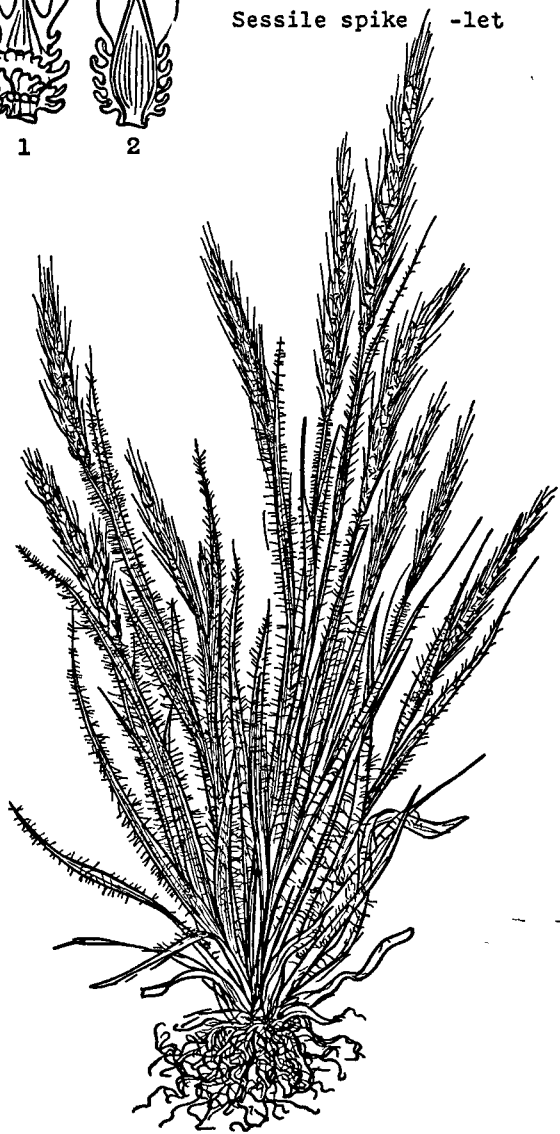
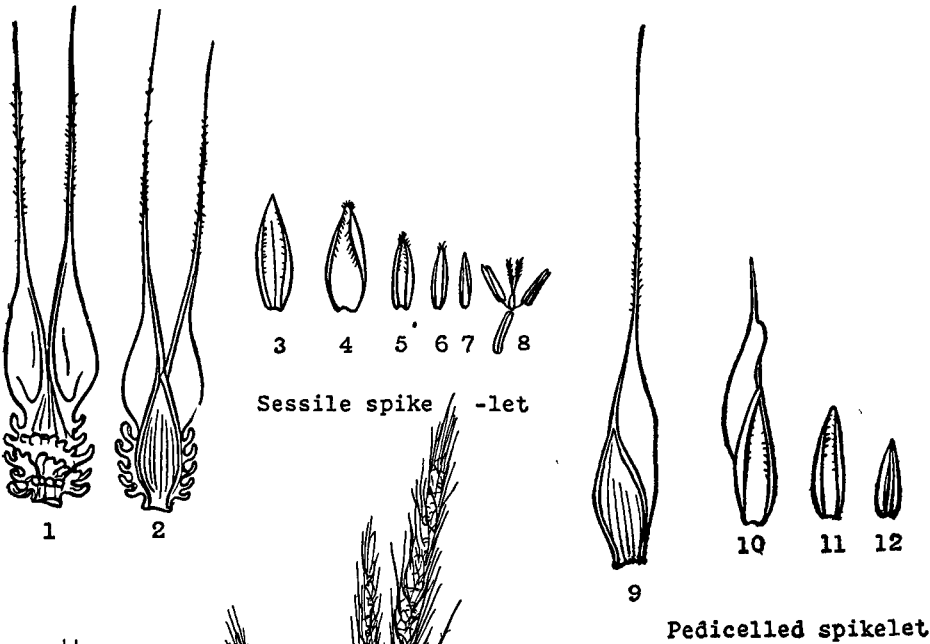
- | | |
|--|------------------------|
| 1. Dorsal view of lower invol. glume. | } Sessile spikelet. |
| 2. Ventral view of lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Palea of lower floral glume. | |
| 6. Upper floral glume. | |
| 7. Palea of upper floral glume. | } Pedicelled spikelet. |
| 8. Stamens and styles. | |
| 9. Lower invol. glume. | |
| 10. Upper invol. glume. | |
| 11. Lower floral glume. | |
| 12. Upper floral glume. | |
| 13. Pedicel. | |

2. *PELTOPHORUS ACUMINATUS* (Hack.) Camus.

PLATE 24

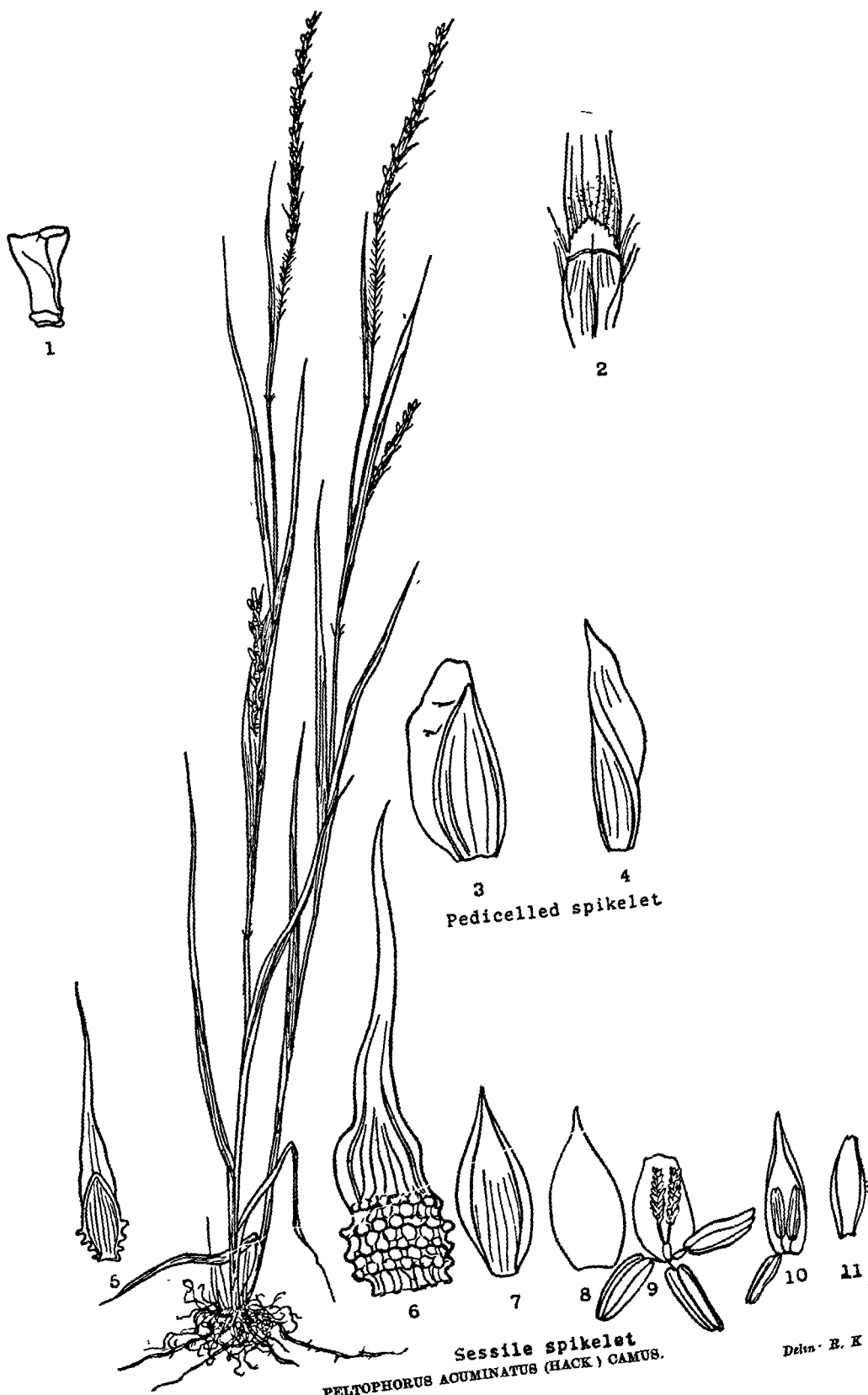
Peltophorus acuminatus (Hack.) Camus in Bull. Mus. Hist. Nat. 5 (1921) 371; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 29.

Rooboellia acuminata Hack. Monogr. Androp. (1889) 296; Lisboa Bomb. Grasses (1896) 56; Hook. f. Fl. Brit. Ind. VII (1896) 155; Cooke Fl. Bomb. II (1908) 953.



PELTOPHORUS DIVERGENS (HACK) CAMUS

Drawn by E. K. Bhide.



Description : Annual, quite glabrous except the sheaths; stems 7.5-30 cm. high, erect or ascending, compressed, densely leafy. Leaves flaccid, the lower 5-7.5 cm. by 2.5-4 mm., linear-lanceolate, acuminate from a narrow base, the upper shorter, spreading and recurved, sheaths turgid, compressed, keeled, the mouth hairy; ligule short, truncate, membranous, glabrous.

Racemes 2.5-5 cm. long, sheathed at the base, straight or slightly curved, usually pale brown; joints subclavate, much shorter than the sessile spikelets, the base not excised. Sessile spikelets up to 8 mm. long, callus scarcely distinct. Glumes 4, lower involucre glume 8 mm. long, sometimes up to 10 and 12 mm., ovate, coriaceous, winged above the middle, with 3-6 dorsal transverse echinulate or warted ridges below the wings, longitudinally striate between the ridges, 5-nerved in the narrow coriaceous part between the wings, with a long ciliate acumen, the cilia pointing upwards, upper involucre glume 4 mm. long (equalling the lower minus the acumen), elliptic-lanceolate, membranous, subacute, scarcely keeled, 3-nerved; lower floral glume equalling the upper involucre glume, elliptic, paleate, male; upper floral glume less than 3 mm. long, oblong, obtuse, nerveless, palea small, 2-lobed, nerveless. Pedicellate spikelets 4 mm. long, oblong, lower involucre glume lanceolate, 5-nerved, with a membranous ciliate wing on one side, upper involucre glume shortly winged on the back below the apex, elliptic, concave, 3-nerved, lower floral glume empty; upper floral glume male, pedicel 2.5 mm. long, dumbbell-shaped, flattened.

Locality : Konkan. Marmagao (Talbot 1291); Vasco da Gama (Herb. St. X. C 9483 !); Malvan (Woodrow).

W. Ghats. Castle Rock (Bhide !).

N. Kanara. Karwar (Talbot 3171 & 2539, Hallberg & McCann A75 !, Lisboa); Katgal (Hallberg & McCann 9934 !).

Distribution : W. Peninsula.

Explanation of Plate 24 : *Peltophorus acuminatus* (Hack.) Camus.

- | | |
|--|------------------------|
| 1. Pedicel. | |
| 2. Ligule. | |
| 3. Lower invol. glume. | |
| 4. Upper invol. glume. | } Pedicelled spikelet. |
| 5. Ventral view of lower invol. glume. | |
| 6. Dorsal view of lower invol. glume. | |
| 7. Upper invol. glume. | |
| 8. Lower floral glume. | } Sessile spikelet. |
| 9. Upper floral glume with stamens and styles. | |
| 10. Palea of lower floral glume with stamens. | |
| 11. Palea of upper floral glume. | |

3. PELTOPHORUS TALBOTI Camus.

Peltophorus Talboti Camus in Bull. Mus. Hist. Nat. 5 (1921) 371, Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 30.

Roibaelia Talboti Hook. f. Fl. Brit. Ind. VII (1896) 155; Lisboa Bomb. Grasses (1896) 57; Cooke Fl. Bomb. II (1908) 954.

Description : Annual, stems 15-20 cm. high, slender, erect, or geniculate at the base. Leaves 5-7.5 cm. by 2.5-3 mm., linear, smooth, sheaths glabrous, ligule short, membranous.

Raceme 20-32 by 4 mm., solitary, green; joints very short, tumid, excavate opposite the spikelet, the top broad, with a very large cavity and thick hispidulous margins. Sessile spikelets 13 mm. long (or more) including the awn, closely imbricating; callus annular, ciliate. Glumes 4; lower involucre glume 5 mm. long (not including the awn), coriaceous, lanceolate, narrowed into a slender scabrid awn, with 2-3 transverse ridges at the base, the uppermost ridge extending right across the glume, the others only in its centre, broadly winged at each side above the base, upper involucre glume 3 mm. long, thinly membranous, ovate-oblong, acute, 1-nerved, lower floral glume broadly oblong, faintly 3-nerved, male, upper floral glume small, oblong, obtuse, nerveless, palea as long, nerveless. Pedicellate spikelets as long as the sessile, lower involucre glume very irregularly winged, dorsally smooth, awnless, as in the sessile, pedicel wholly adnate to the joint of the rachis.

Locality : Konkan. Vasco da Gama (Bhide !); Marmagao (Talbot 2572 !).

Distribution : So far only found in Goa.

17. *Lasiurus* Boiss.

Perennial; more or less branched and woody below; branches often in dense fascicles, intravaginal; blades linear, convolute or flat, hard; ligule a fringe of hairs.

Racemes silky-villous. Spikelets usually 3-nate, rarely 2-nate, on the more or less fragile rachis of villous spike-like racemes which terminate the culms and their branches (if any) and are supported by or exerted from often spathaceous sheaths, if 3-nate 2 sessile, the sessile different in sex from, but similar in shape to, the pedicelled; rachis nodes bearded all round; joints and pedicels linear, the latter more slender and shorter, opposite the joints if 2 sessile spikelets be present, otherwise approximate, but not contiguous, and parallel to one of the sides of the joint, disarticulation at a right angle to the rachis, scar at the tips of the joints suborbicular, smooth, often ciliate. Sessile spikelets, if 2, one on each side of the pedicel with a narrow annuliform callus. Florets 2, lower male, upper hermaphrodite, awnless. Involucral glumes unequal; lower longer, subcoriaceous, flat on the back, acuminate 2-keeled upwards and 2-dentate, densely ciliate, upper boat-shaped, membranous, keeled. Floral glumes hyaline, 3-nerved. Paleae hyaline, 2-nerved. Lodicules 2, cuneate. Stamens 3. Stigmas linear, laterally exerted. Grain oblong, slightly dorsally compressed, embryo half its length. Pedicelled spikelet similar to the sessile, but with an indistinct glabrous callus and with both florets male or more or less reduced.

Species 1 or 2.—From Nubia through Arabia and Baluchistan to Sind and Rajputana.

1. *Lasiurus hirsutus* Boiss.

PLATE 25.

Lasiurus hirsutus Boiss. Diagn. ser. 2, IV (1859) 146; Stapf Fl. Trop. Afr. IX (1917) 60.

Saccharum hirsutum Forsk. Fl. Aeg.-Arab. (1775) 16.

Rotheilia hirsuta Vahl Symb. I (1790) 11; Hack. Monogr. Androp. (1889) 311.

Ischaemum mastrucatum Trin. in Mem. Acad. Petersb. 6me ser. II, 296.

I. hirsutum Nees in Schump. Pl. Arab. Fel. no. 791.

Coelorhachis hirsuta Brogn. apud Dene. in Ann. Sc. Nat., 2 ser. II, 13.

Etiomurus hirsutus Munro ex Benth in Journ. Linn. Soc. XIX (1881) 68; Boiss. Fl. Or. V (1884) 466, Hook. f. Fl. Brit. Ind. VII (1896) 162.

Etymology: *Lasiurus* is derived from *lasios*, woolly, and *oura*, tail, alluding to the silky-villous racemes.

Description: Perennial, rootstock woody, branched; stems 30-60 cm., ascending from a branching base, stout, smooth, rigid, more or less scabrid or pubescent; nodes pubescent. Leaves 7.5-15 cm. by 2.5-4 mm., linear, finely acuminate; sheaths terete, glabrous or nearly so, the upper sheaths shorter than the internodes, glaucous or nearly white.

Raceme solitary, stout, 5-10 cm. long, silvery-silky all over; joints shorter than the sessile spikelets, subclavate, densely villous on the back. Sessile spikelets at each node of the rachis, solitary or 2-nate, imbricate, reaching 1 cm. long or more (including the beak), pale green. Glumes 4; lower involucral glume 1 cm. long (including the beak), coriaceous, 7-9-nerved, the beak often as long as the body of the glume, deeply 2-fid, densely silky-villous, the lobes divergent, upper involucral glume 6 mm long, ovate, aristately acuminate, chartaceous, 3-5-nerved, the acumen ciliate at the tip; lower floral glume equalling the upper involucral glume, hyaline, ovate-oblong, acute, 3-nerved, paleate, the palea lanceolate, acute, as long as the glume, upper floral glume shorter, ovate, acute, glabrous, with incurved margins. Pedicellate spikelets rather shorter than the sessile ones; pedicels about 4 mm. long, shorter than the joints, flattened, subclavate, hairy on the back and with ciliate margins.

Locality: Sind—Karachi (Bhude!), Sehwan to Laki, foot of hills (Sabnis B613!); Umarkot, sandy plains (Sabnis B940!).

Distribution: Rajputana, Sind, Punjab, Baluchistan, Afghanistan, Arabia, Brit. Somaliland, Egypt, Nubia.

Explanation of Plate 25: *Lasiurus hirsutus* Boiss.

- | | |
|---|----------------------|
| 1. Spikelets. | } Sessile spikelets. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Palea of lower floral glume. | |
| 6. Upper floral glume. | |
| 7. Palea of upper floral glume, with stamens, ovary and styles. | |



LASIURUS HIRSUTUS BOISS.

Dehn R K Hyde



ELYONURUS ROYLEANUS NEES

Detn: E. K. Bhide.

18. *ELYONURUS* Humb. & Bonpl.

Generally perennial, caespitose, aromatic; blades flat or folded; ligules membranous, very short.

Racemes erect, joints strongly compressed, usually villous, tips oblique, not appendaged. Spikelets similar, usually awnless, but differing in sex, 2-nate, one sessile, the other pedicelled, on the articulate fragile rachis of solitary spike-like racemes, the sessile deciduous with the adjacent joint of the rachis and the pedicel. Florets 2; lower reduced to an empty floral glume; upper hermaphrodite in the sessile, male, rarely barren, in the pedicelled spikelet. Involucral glumes equal; lower subcoriaceous to herbaceous, often 2-toothed or 2-fid, rarely awned, dorsally flattened, 2-keeled, usually with fine filiform transparent balsam ducts close to the ciliate or penicillate keels; upper membranous, lanceolate, acute, rarely awned. Floral glumes hyaline, awnless. Palea obsolete or 0. Lodicules 2, cuneate. Stamens 3. Stigmas laterally exerted. Grain oblong, dorsally compressed; embryo about half the length of the grain.

Species about 15.—Tropical and subtropical regions of both hemispheres.

1. *ELYONURUS ROYLEANUS* Nees.

PLATE 26.

Elyonurus Royleanus Nees ex A. Rich. Tent. Fl. Abyss. II (1851) 471; Stapf Fl. Trop. Afr. IX (1917) 65; Hack. Monogr. Androp. (1889) 343, Lisboa Bomb. Grasses (1896) 63; Hook. f. Fl. Brit. Ind. VII (1896) 161; Dutae Grasses N. W. Ind. (1883) 17, Fodder Grasses N. Ind. (1888) 28, t 54; Cooke Fl. Bomb. II (1908) 972.
E. Grisebachii Schmidt Beitr. z. Fl. Capverd. (1852) 154.
Ratzeburgia Schimper Steud. Nomencl. ed. II (1840) 439.
Roiboechia elegantissima Hochst. ex Steud. Syn. Pl. Glum. I (1855) 365.
Andropogon elegantissimus Steud. l. c. 364.
A. Grisebachii Steud. l. c. 365.

Etymology: *Elyonurus* is derived from *elyo*, to involve, roll or wrap up, and *oura*, a tail, referring to the racemes which are embraced below by the spathe.—*Royleanus* after J. F. Royle (1800-58) once Curator of Saharanpur.

Description: Annual, stems 7.5-30 cm. high, slender, leafy, geniculate; nodes pubescent. Leaves 3-8-10 cm. by 1-2.5 mm, linear-lanceolate, acute or acuminate, rigid, suberect, at first green then together with the whole plant turning red, glabrous or sparsely hairy, fimbriate at the base; lower sheaths terete, much shorter than the internodes, the upper spathiform; ligule very short, membranous.

Racemes 2.5-5 cm. long, erect, yellowish green or often variegated with purple, each enclosed in a long narrow flattened sheath, joints densely bearded at the apex with long white silky hairs, obliquely disarticulating, shorter than the sessile spikelets. Sessile spikelets nearly 13 mm. long (including the beak); callus about 0.8 mm. long, densely bearded. Glumes 4; lower involucral glume coriaceous, nearly 13 mm. long (including beak), running out into a usually violet-coloured, 2-fid beak about 6 mm. long, the lobes ciliate, linear, slightly divergent, the margins of the glume below the beak with a row of large violet-coloured tubercles each carrying a pencil of whitish glistening hairs; upper involucral glume as long as the body of the lower, linear-lanceolate, acuminate, finely mucronate, membranous, 1-nerved; lower floral glume a little shorter than the involucral glumes, oblong, acute, nerveless, glabrous, epaleate; upper floral glume much shorter than the lower, oblong, obtuse, nerveless. Pedicellate spikelets: pedicels 3 mm long, ciliate on one margin. Spikelets linear-subulate. Lower involucral glume 1 cm long, narrowed almost from the base into a long narrow linear ciliate beak; upper involucral glume 6 mm. long, ovate-lanceolate, concave, membranous, narrowed into a short scabrid purplish awn.

Locality: Sind (Woodrow).

Cutch · Bhodir Maka (Blatter 3747 !); Bhuj (Blatter 3795 !).

Kathawar · Rajkot (Woodrow).

Distribution: Upper Gangetic Plain, Rajputana, W. Peninsula, Arabia, Somaliland, Eritrea, Abyssinia, Sudan, Nubia, Cape Verde Islands.

Explanation of Plate 26: *Elyonurus Royleanus* Nees.

- | | |
|------------------------|---------------------|
| 1 Lower invol. glume. | } Sessile spikelet. |
| 2 Upper invol. glume. | |
| 3. Lower floral glume. | |
| 4. Upper floral glume. | |
| 5. Grain. | |

19. ROTBOELLIA Linn. f.

Annual, usually coarse grasses, often with stilt-roots from the lowest nodes, more or less branched, particularly upwards; blades large, linear-lanceolate, rather wide; ligule membranous, short

Racemes dorsiventral, with the spikelets placed anticeously and laterally, the barren terminal appendages often very slender and their imperfect spikelets very narrow, green. Spikelets 2-nate on the nodes of the very fragile rachis of stout cylindric perfectly glabrous spike-like racemes which terminate the culms and their branches (in the latter case spathe-supported), different in sex and usually also in size, colour and nervation except those of the uppermost pairs which are barren, homoeomorphous and upwards increasingly reduced forming a tail-like tapering appendage to the raceme, joints dorsally flattened below, widely cup-shaped and hollowed out upwards, more or less completely fused, although externally marked off, with the equally flattened and upwards very slightly thickened pedicels along their posticous angles, forming a deeply concave rather thin-walled receptacle for the reception of the sessile spikelet, disarticulation of the joints at a right angle or oblique to the rachis of the pedicelled spikelets slightly oblique, leaving a crescent-shaped, faintly concave scar. Sessile spikelet pale, triangular in cross section, the narrow callus fused with the bases of the adjacent joint and pedicel into a glabrous ring from the centre of which protrudes a knob fitting into the cup-shaped hollow of the next lower joint, the whole plexus falling together. Florets 2, lower male, upper hermaphrodite, awnless. Involucral glumes equal; lower coriaceous, flat on the back, with very narrow inflexed margins, 2-keeled upwards, obtuse or subobtusate, upper boat-shaped, keeled upwards, acute. Floral glumes hyaline, 3-nerved. Paleae as long or almost as long as the floral glumes, hyaline, 2-nerved. Lodicules 2, cuneate. Stamens 3. Stigmas suberect or shortly laterally exserted above the middle of the spikelet. Grain broad-oblong or ellipsoid, dorsally compressed; hilum large, suprabasal; embryo almost as long as the grain. Pedicelled spikelet similar to the sessile, but more compressed, green, striate, with 2 male florets, or smaller and more or less reduced.

Species 2 or 3—Tropics of the Old World.

1. ROTBOELLIA EXALTATA Linn. f.

PLATE 27.

Rotboellia exaltata Linn. f. Suppl. (1781) 114, Roxb. Pl. Corom. t. 157, Fl. Ind. I (1832) 354; Grah. Cat. Bomb. Pl. (1839) 233, Duthie Grasses N. W. Ind. (1883) 17; Lisboa Bomb. Grasses (1896) 58; Hack. Monogr. Androp. (1889) 293; Hook. f. Fl. Brit. Ind. VII (1896) 156; Cooke Fl. Bomb. II (1908) 955.

R. exaltata var. *genuina* Schweinf. in Höhnelt Disc. Lakes Rud. and Stefanie II, App. 352.

R. exaltata f. *arundinacea* Hack. in Bot. Soc. Brot. V, 215.

R. arundinacea Hochst ex A. Rich. Tent. Fl. Abyss. II (1851) 444.

Stegosia cochinchinensis Lour. Fl. Cochinch. (1790) 51.

S. exaltata Nash in Americ. Fl. XVII, I, 84.

Vernacular names: Bursah, Bura, Soato, Konda canookoo.

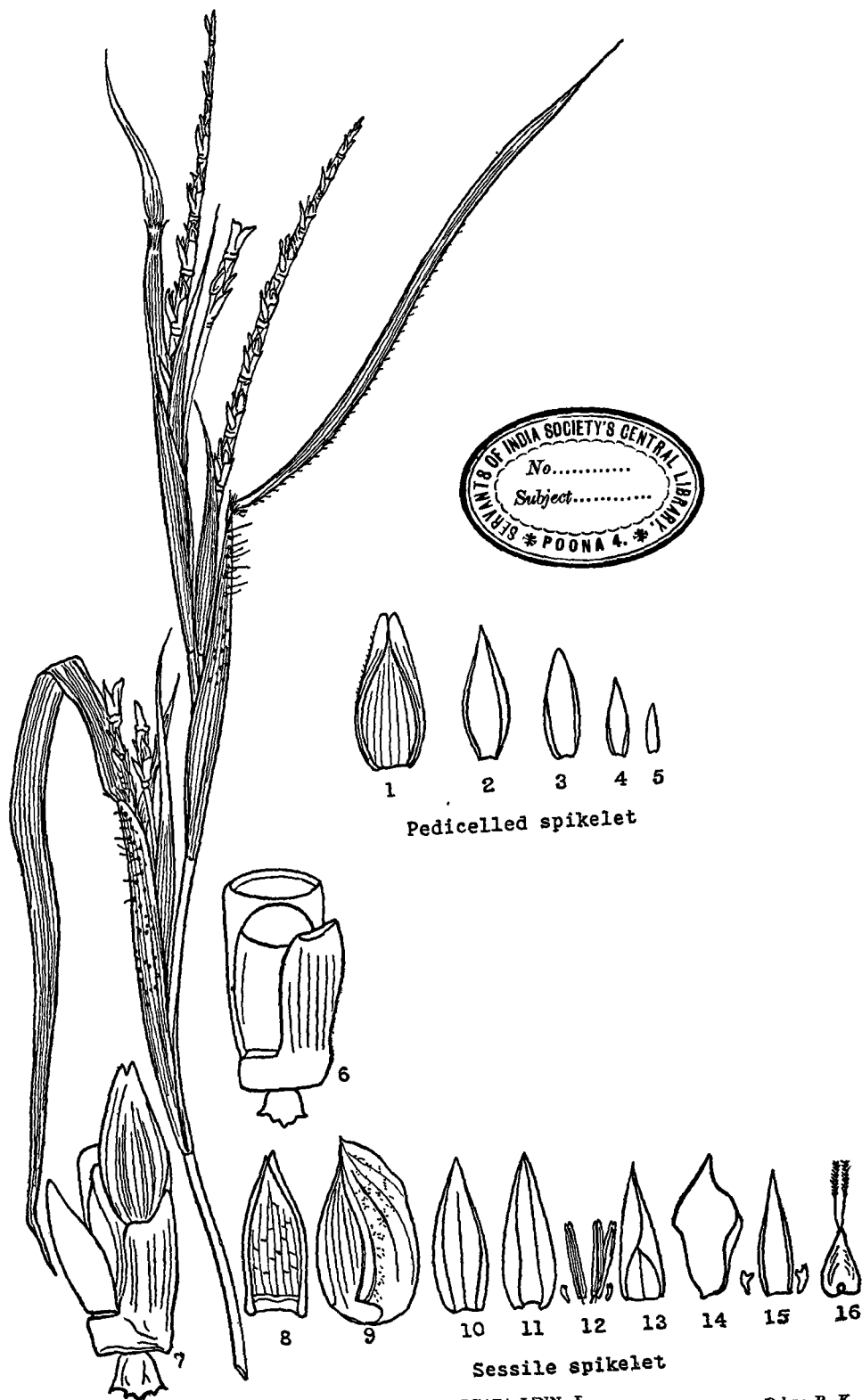
Etymology: *Rotboellia* after C. F. Rotboell, 1727-1797, a Danish botanist.—*Exaltata* means exalted, alluding to the great height of the plant

Description: Perennial, stem 1.8-3 m high, erect, leafy, solid, smooth, branching from the base. Leaves 15-60 cm. by 6-25 mm, linear-lanceolate, setaceously acuminate, scabrid or hispid and green above, smooth and glaucous beneath, the margins spinulosely scabrid, midrib stout, prominent beneath, sheaths loose, glabrous or hispid, the mouth contracted, ligule short, ciliate.

Racemes 7.5-15 cm long, terete, glabrous, fragile, the upper part of the raceme slender, with imperfect spikelets, internodes 4-5 mm long, dorsally rounded, smooth. Sessile spikelets about as long as the internodes, 5 mm long. Glumes 4, lower involucrel glume 5 mm. long, ovate-oblong, obtuse, coriaceous, smooth, with truncate base, many obscure nerves and scaberulous margins, upper involucrel glume equalling the lower, chartaceous, broadly ovate, acute, 9-11-nerved, the keel very shortly winged towards the tip, lower floral glume as long as the lower involucrel glume, broadly ovate, acute, 3-nerved, rigidly membranous, paleate, male, the palea like the glume, with incurved margins; upper floral glume a little shorter than the lower, ovate from a broad base, acute, 1-nerved; palea as long as the glume, hyaline, nerveless. Pedicellate spikelets more or less imperfect; lower involucrel glume narrowly winged.

Locality: Konkan: Doh forest, Thana Dist. (Ryan 711!).

Deccan: Poona (Blude!), Cooke, Woodrow 2!), Agricultural College Farm (Herb. Econ. Bot. Poona!); Purandhar, 4,000 ft. (McCann 5591!).



ROTBUELLIA EXALTATA LINN F

Desm. B K Bhude

S. M. Country : Dharwar, in field (Sedgwick 5469!).

N Kanara : Hattikeri, near Karwar (Hallberg & McCann A74!).

Distribution : India, Andamans, Ceylon, China, Malaya, Australia, Africa.

Economic uses : According to Welwitsch the grass is much disliked by cattle.

Explanation of Plate 27 : *Roiboltha exaltata* Linn. f.

- | | | |
|---|---|----------------------|
| 1. Lower invol glume. | } | Pedicelled spikelet. |
| 2. Upper invol glume | | |
| 3. Lower floral glume | | |
| 4. Upper floral glume | | |
| 5. Palea of upper floral glume. | | |
| 6. Joint of rhachis with the spikelets removed, showing the hollow at the top into which the basal portion of the upper joint fits. | | |
| 7. Joint with spikelets | } | Sessile spikelet. |
| 8. Lower invol. glume. | | |
| 9. Upper invol glume | | |
| 10. Lower floral glume | | |
| 11. Palea of lower floral glume | | |
| 12. Stamens and lodicules. | | |
| 13. Upper floral glume (ventral view). | | |
| 14. Upper floral glume (lateral view). | | |
| 15. Palea of upper floral glume and lodicules. | | |
| 16. Grain | | |

VAR ROBUSTA Hook. f.

Var. robusta Hook f. Fl Brit. Ind VII (1896) 156.

Description : Leaf-base more cordately confluent with the sheath. Spikes stouter below, slender above the middle. Spikelets in upper half distichously imbricate, longer than the joints, fertile nearly to the tip. Paleas of upper floral glume auricled at the base.

Locality : Deccan. Poona (Woodrow ex Hook. f.).—We have not seen this plant.

Distribution : Malabar and Palamcottah

20. *OPHIURUS* Gaertn. (*partim*), Stapf in Fl Trop. Afr. IX (1917) 74.

Annual (?) or perennial, sometimes very coarse grasses, usually much-branched upwards; blades linear to lanceolate, short to very long, conduplicate or convolute in bud, then flat; ligules very short, membranous.

Racemes dorsiventral. Spikelets solitary on the nodes of the fragile rhachis of slender cylindric spikes which terminate the culms and their usually fascicled spathe-supported branches, their pedicelled companions suppressed or rudimentary and very minute and the pedicels completely fused with the joints, both forming together a deeply hollowed out cylindric receptacle for the reception of the sessile spikelet, disarticulation of the internodes at a right angle or slightly oblique to the rhachis, their tips hollowed out. Sessile spikelet with a very narrow callus which is fused with the base of the internode into a rim from the centre of which protrudes a small knob fitting into the hollow of the next lower internode, the whole plexus falling together. Florets 2, lower male or neuter, upper hermaphrodite, awnless. Involucral glumes equal; lower coriaceous, flat or subconvex on the back with very narrow inflexed margins, faintly nerved, with a transverse groove at the base, upper boat-shaped, hyaline, obtuse. Floral glumes hyaline, 2-nerved or nerveless. Paleae similar to the floral glumes. Lodicules 2, cuneate. Stamens 3. Stigmas short, laterally exerted. Grain oblong, dorsally slightly compressed, embryo a quarter the length of the grain.

Species about 4.—From the Sudan through tropical Asia to Australia

Stapf has described the species *Ophiurus megaphyllus* which forms part of *O. corymbosus* Hook. f. in Fl Brit Ind. VII, 160 (not of Gaertn. f. and not of *Roiboltha corymbosa* Linn. f.). What is left over of Hook. f.'s *O. corymbosus* after the separation of *O. megaphyllus* has to go under *O. corymbosus* Gaertn. f.

- | | | |
|--------------------------------|--------------------|----------------------------|
| 1. Leaves ensiform, very hairy | Robust, 1.5-1.8 m. | 1. <i>O. megaphyllus</i> . |
| 2. Leaves linear, glabrous. | Slender, 0.6-1.2 m | 2. <i>O. corymbosus</i> . |

1. *OPHIURUS MEGAPHYLLUS* Stapf.

Ophiurus megaphyllus Stapf in Haines Bot. Bih. and Or. pt. V (1924) 1058.

O. corymbosus Hook. f. Fl. Brit. Ind. VII (1896) 160 (*partim*, non Gaertn. f.); Cooke Fl. Bomb.

II (1908) 951 (*partim*); Hack. Monogr. Androp. (1889) 317 (*partim*).

Vernacular names : Sputter, Sut, Southi, Katua, Karvel.

Etymology : *Ophiurus* derived from *ophis*, a snake, and *oura*, a tail; the allusion is not clear — *Megaphyllus* means big-leaved.

Description : A large stout grass, 1.5-1.8 m. high, very leafy to the top. Leaves narrowly ensiform, tapering from base to apex, upper 10-18 mm. wide, lower much wider, flat, very hairy as are the sheaths, but more or less glabrescent with age, hairs with small tubercle bases, margins of sheath hirsute.

Spikelets 2-4 mm., slightly shorter or longer than the joints, in very numerous peduncled spikes 7.5-10 cm. long, from the leaf-axils. Peduncles 7.5-12.5 cm., sheathed at the base, finally far exserted, each solitary on a branch with a villous node, often geniculate at the node. Sessile spikelets. glumes 4. Lower involucre glume oblong, glabrous, with rounded tip, smooth or with few lines of small pits, not becoming recurved sometimes bearing a small appendage. Upper involucre glume white, becoming inclined forward, quite free from the rachis when the spikelet opens. Pedicelled spikelets: the lowest are sometimes free at the top and bear a small brown free appendage.

Locality : We have not been able to examine all the specimens which were formerly put under *O. corymbosus* Hook. f. and we are, therefore, not in a position to assign any specimen to *O. megaphyllus* Stapf.

Distribution : To make a definite statement all the herbarium material of *O. corymbosus* Hook. f. would have to be examined.

2. OPHIURUS CORYMBOSUS Gaertn. f.

PLATE 28

Ophiurus corymbosus Gaertn. f. Fruct. III, 4, t. 181, f. 3a (*Ophiuros*); Haines Bot. Bih. and Or. pt. 5 (1924) 1058.

Rotboellia corymbosa Linn. f. Suppl. (1781) 114.

Ophiurus corymbosus Hook. f. Fl. Brit. Ind. VII (1896) 160 (*partim*); Cooke Fl. Bomb. II (1908) 951 (*partim*).

Vernacular name : Hutia

Description : Perennial. Stems very numerous, glabrous, erect, slender, 0.6-1.2 m. high, bulbous at the base, the bulbous bases connected into a horizontal rhizome. Leaves linear, glabrous, up to 5 mm. broad, margins minutely tubercled at base, the tubercles bearing cilia when young.

Spikes very slender, 5-12.5 cm. long, sometimes ending in a small tail like that of a rattlesnake (Haines), spikelets 2.5 mm. long, equalling the joint. Lower involucre glume of sessile spikelet glabrous, with many longitudinal lines of small pits, narrowly oblong, tip rounded, finally recurved.

Locality : Deccan : Deolali (Blatter & Hallberg 4564 !); Nasik Road (Blatter 9624 !); Talegaon (McCann ?).

Distribution : Not known to us.

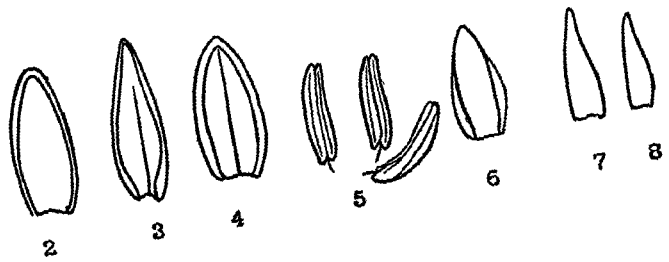
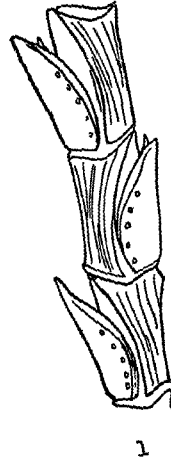
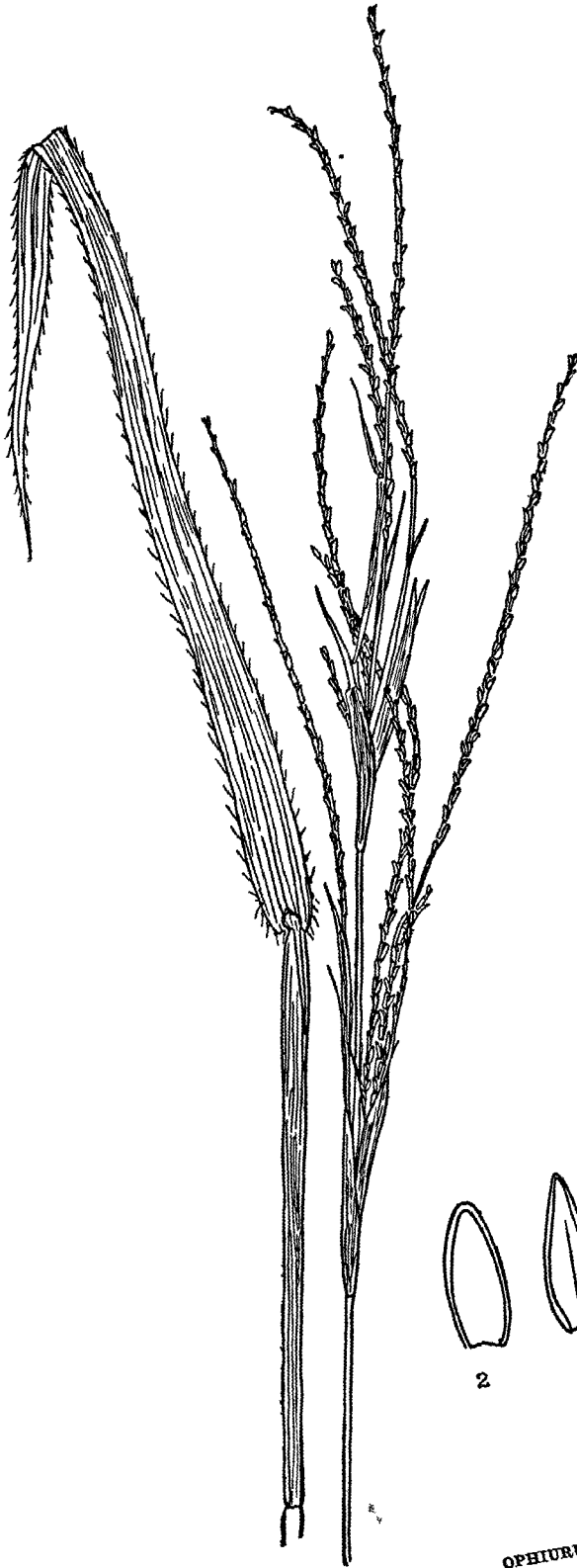
Explanation of Plate 28 : *Ophiurus corymbosus* Gaertn. f.

1. Part of spike.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Stamens.
6. Palea of lower floral glume.
7. Upper floral glume.
8. Palea of upper floral glume.

21. COELORRHACHIS R. Br.

Mostly tall coarse perennial grasses, much-branched upwards.

Racemes with the not rarely imbricate sessile spikelets placed anticously and the pedicelled laterally. Spikelets 2-nate on the nodes of the fragile rachis of slender more or less compressed conspicuously dorsiventral spike-like racemes which terminate the culms and their usually fascicled spathe-supported branches, different or very rarely alike in sex, similar in shape or the pedicelled more or less to very much reduced; joints and pedicels similar or the latter more slender, linear to cuneate or subclavate, dorsally compressed, glabrous, contiguous or nearly so; disarticulation of the joints at a right angle to the rachis, their tips more or less hollowed out, with or without an auriculate appendage. Sessile spikelet dorsally compressed, the narrow transverse callus fused with the bases of the adjacent joint and



OPHIURUS CORYMBOSUS GAERTN. F.



COELORRHACHIS CLARKEI (HACK) BLATTER & McCANN.

Delin R. K. F.

pedicel into an obscure rim from the centre of which protrudes a knob fitting into the hollow of the next lower joint, the whole plexus falling together. Florets 2, lower usually reduced to the floral glume, rarely with a small palea, always neuter, upper hermaphrodite, awnless. Involucral glumes subequal, lower flat or slightly convex on the back, smooth or variously sculptured with narrow inflexed margins, 2-keeled upwards and more or less winged from the keels, obtuse or emarginate, very faintly nerved, upper chartaceous, keeled, acute, 1-3-nerved. Floral glumes hyaline, of lower floret 2-nerved or nerveless, of upper 3-1-nerved or nerveless. Palea hyaline, similar to the floral glume, 2-nerved or nerveless. Lodicules 2, cuneate. Stamens 3. Stigmas laterally shortly exserted. Grain oblong, dorsally compressed; embryo about half the length of the grain. Pedicelled spikelet very varied, similar to the sessile or more or less reduced or rudimentary, male or neuter, very rarely hermaphrodite.

Species about 12.—Tropics of both hemispheres.

1. *COELORRHACHIS CLARKEI* (Hack.) Blatter & McCann.

PLATE 29.

Coelorrhachis Clarkei Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 33.
Rotboellia Clarkei Hack in Oestr. Bot. Zeitschr. 41 (1891) 8, Hook. f. Fl. Brit. Ind. VII (1896) 156; Cooke Fl. Bomb. II (1908) 954.

R. gibbosa Hack ex Lusboa Bomb. Grasses (1896) 58.

Etymology: *Coelorrhachis* is derived from *koalas*, a hollow or cavity, and *rhachis*, referring to the more or less hollowed out tips of the joints.

Description: Annual, stem 20-60 cm high, erect, striate, compressed, nodes with a small ring of hairs. Leaves 10-15 cm. by 8-13 mm, linear-lanceolate, acuminate, narrowed to the subordinate base, scabrous and more or less hairy, the hairs with minutely tubercular bases, midrib prominent; sheaths compressed, ciliate; ligule a hairy membrane.

Raceme solitary, 13-25 mm long, pale yellow, supported by a spathe; rhachis very fragile; joints pyriform, shorter than the spikelets, ciliate and with a broad cavity at the tip, the sides not hollowed. Sessile spikelets 2.5-3 mm long, obtuse, closely imbricating, callus short and broad, cylindric. Glumes 4, lower involucreal glume with an ovate coriaceous 3-5-nerved disk and hyaline wings which are ciliate at the tip, dorsally gibbous, scabrid and hairy below the middle, upper involucreal glume 2.5 mm long, ovate-oblong, subacute, membranous, 1-nerved, glabrous; lower floral glume shorter than the upper involucreal glume, ovate-oblong, subobtuse, hyaline, nerveless, upper floral glume rather smaller than the lower, oblong, obtuse, hyaline, nerveless, the margins incurved, palea like the glumes, nerveless. Pedicellate spikelets imperfect, consisting usually of a solitary empty glume about 1.2 mm. long; pedicel quite free from the rhachis, pyriform, flattened, about 1.5 mm. long.

Locality: N. Kanara. Birchy (Talbot 2072! 2820!), Jugglepet (Talbot 15661).

Distribution: Chota Nagpur, W. Peninsula.

Explanation of Plate 29: *Coelorrhachis Clarkei* (Hack.) Blatter & McCann.

- | | |
|----------------------------------|------------------------|
| 1. Lower invol. glume. | } Pedicelled spikelet. |
| 2. Upper invol. glume | |
| 3. Lower floral glume | |
| 4. Upper floral glume. | |
| 5. Palea of upper floral glume. | } Sessile spikelet. |
| 6. Spikelets and joint | |
| 7. Lower invol. glume | |
| 8. Upper invol. glume. | |
| 9. Lower floral glume | |
| 10. Upper floral glume. | |
| 11. Palea of upper floral glume. | |
| 12. Stamens and styles. | |

22. *IMPERATA* Cythl.

Erect perennial grasses, stem leafy; internodes solid. Leaves narrow.

Spikelets 1-flowered, in spike-like subcylindric silvery-silky panicles, with very short filiform inarticulate branches and rhachises, all alike and 2-sexual, narrow, terete, hidden among very long hairs arising from a small callus and from outer glumes, 2-nate, a sessile and a pedicellate one, articulate at the base, fugacious. Glumes 4; involucreal glumes subequal, membranous, dorsally rounded or the upper obscurely keeled, 3-5-nerved at the base; lower involucreal glume ovate-lanceolate with a hyaline obtuse tip; upper involucreal glume

acuminate; floral glumes short, often erose; palea minute, hyaline. Lodicules 0. Stamens 1 or 2. Styles connate below; stigmas very long, narrow, exerted at the top of the spikelets. Grain small, oblong.

Species 5 or 6, mostly closely allied — Warm regions of both hemispheres

1. IMPERATA CYLINDRICA (Linn.) P. Beauv.

PLATE 30.

Imperata cylindrica (Linn.) P. Beauv. Agrost. (1812) 165, t. V, fig. 1, Expl. planch. 5; Stapf in Fl. Trop. Afr. IX (1917) 87; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 281.

I. arundinacea Cyrill Pl. Rar. Neap. fasc. 2 (1792) 26, t. 11; Hack. Monogr. Androp. (1889) 92, Boiss. Fl. Or. V (1881) 452; Duthie Grasses N. W. Ind. (1883) 14, Indig. Fodder Grasses (1886) t. 15, Fodder Grasses N. Ind. (1888) 22; Hook f. Fl. Brit. Ind. VII (1896) 106, Lasboea Bomb. Grasses (1896) 45; Cooke Fl. Bomb. II (1908) 946; R. S. Hole in Ind. For. Mem. I (1911) 91.

I. Alang Jungh in Tijdschr. Nat. Gesch. VII, 295.

I. condensata Steud. Syn. Pl. Glum. I (1855) 431.

I. filifolia Nees ex Steud. l.c.

I. Koenigii P. Beauv. Agrost. (1812) 165.

I. pedunculata Steud. in Flora XXIX (1846) 22.

Saccharum cylindricum Lam. Encycl. I, 594, Roxb. Fl. Ind. I (1832) 234; Grah. Cat. Bomb. Pl. (1839) 239.

S. diandrum Koen. ex Retz. Obs. V, 16.

S. Koenigii Retz. Obs. l.c.

S. laguroides Pourr. in Mem. Acad. Toul. III (1788) 326.

S. Ravennae Bieb. Fl. Taur. Cauc. III, 51.

Lagurus cylindricus Linn. Syst. ed. X, 878.

Calamagrostis Lagurus Koel. Descr. Gram. (1802) 112.

Vernacular names : Dhub.

Etymology : *Imperata* was given in honour of F. Imperati, a Neapolitan botanist.

Description : Culms erect, simple, slender, from 12 cm. in height and almost filiform to 2.8 m. high and 8 mm. diam., 3-4-noded, glabrous, solid, slightly fistular at base; leaf-insertions tumid, glabrous, or densely bearded with erect white hairs. Leaf-sheaths rather loose, glabrous or glabrescent, ciliate or glabrous along the margin towards the apex, the lowest at length usually breaking up into fibres, usually longer than proper internode, ligules membranous, rounded, truncate or 2-lobed, ciliate, dorsally silky, attaining a height of 3 mm. Blade of uppermost leaf of flowering culm from mucroniform and 1.25 mm. long to 15 cm. long and 6 mm. wide with greatest width in middle, of lower leaves erect or arcuate and attaining a length of 1.2 m. and width of 27 mm., greatest width about the middle, dark green, midrib white, apex acuminate, narrowed towards the base where the midrib occupies almost the entire width of the leaf, smooth, but scabrid on margin and on one or more submarginal nerves above, especially towards the apex, white villous above on margins towards the base and behind the ligule.

Panicle spike-like, 3-50 cm. long, not exceeding 25 mm. in width, cylindrical, very dense; branches and branchlets very numerous, crowded, appressed, pedicels fine with clavate tips, glabrous, scaberrulous or pubescent, with long fine hairs below. Flowering panicle purple with the exerted stigmas, the callus-hairs being closely appressed to the axis, fruiting panicle silvery-white with the wide-spreading callus-hairs. Spikelets not awned, lanceolate, 3 mm. long, both spikelets of each pair similar, each 1-flowered and hermaphrodite, and at length falling from the pedicel; callus-hairs soft, white 2-3 times as long as the spikelets. Lower involucre glume lanceolate, membranous, slightly thickened towards the base, apex hyaline, 3-9-nerved, none of the nerves extending to apex of glume, margins incurved, ciliate above, dorsally villous with soft white hairs overtopping the glume by $1\frac{1}{2}$ to 3 times the length of the glume. Upper involucre glume similar and subequal to the lower, but sometimes subkeeled with midnerve extending almost to apex. Lower floral glume oblong, hyaline, nerveless, apex acute or subtruncate and lacinate or denticulate, ciliate, $\frac{1}{2}$ to $\frac{3}{4}$ of the size of upper involucre glume. Upper floral glume subequal to the lower one, ovate-lanceolate, hyaline, nerveless, apex acuminate, acute, or obtuse and lacinate or denticulate, minutely ciliate or glabrous. Palea quadrate, rectangular or subpentagonal, hyaline, nerveless, apex denticulate or unequally lacinate, glabrous or ciliate, $\frac{1}{2}$ the size of the upper floral glume or subequal to it. Lodicules none or very minute. Anthers 2, 2.5-3 mm. long, orange, filaments sometimes connate below. Stigmas 2, 3-4 mm. long, purple.

Some authors distinguish varieties and subvarieties which scarcely seem to be justified. Stapf who mentions two varieties *var. Thunbergii* Durand & Schinz, and *var. Koenigii* Durand & Schinz, says in a note (l.c. 89) : "The varieties and the type, although on the whole pretty distinct within their areas, often pass into each other, chiefly along the confines of their areas, or they possibly lose their distinctive characters under particular local conditions, when the separation becomes almost impossible." This does not speak in favour of good varieties. Hackel (l.c. 93-95) has 3 varieties and several subvarieties, and Anderson (in Oefvers K. Vet. Akad. Forh. Stockh. 1885, p. 157) is still more liberal with his subvarieties. Hook f makes one variety *latifolia* (F. B. I. l.c.) and remarks about one of Hackel's varieties "Hackel distinguishes the Indian form as *var. Koenigii*, having villous nodes and broader, less rigid leaves, but some of the Indian specimens appear to me quite like the Western." Hackel's division depends chiefly on such characters as hairiness of the leaf-insertions, width of the leaves and height of the ligule. The height and shape of the ligule, however, seems, according to Hole's investigations, more or less correlated with the width of the lamina, while the other characters appear to vary with the locality and do not define forms of any constancy. Hole's treatment of *Imperata arundinacea* (On some Indian For. Grasses and their Oecology, 1911, p. 95) appeals to us much more. Amongst the material observed at Dehra Dun he distinguishes 3 forms which are more or less clearly defined.

- (a) The depauperate form common on lawns or areas where the grass is continually cut or grazed, with minute, almost filiform, culms and small leaves. Leaf-insertions usually long-bearded. Glume IV and palea usually glabrous.
- (b) The ordinary savannah form which usually attains a height of about 90 cm. with leaves up to 17 mm wide. Leaf-insertions bearded or glabrous. Palea and glume IV ciliate.
- (c) A robust form found in swamps or marshy soil where there is an abundance of available moisture more or less throughout the year. This plant attains a height of 2-8 m. and probably more. Leaves up to 26 mm. wide, leaf-insertions glabrous. Palea and glume IV ciliate. This is identical with *var. latifolia* Hook f.

Forms of this kind could be multiplied according to various localities. As we are not going to distinguish any varieties we have given a description of the species including all the variations that so far have been observed.

Locality : *Sind* (Stocks)

Gujarat (Graham).

Konkan : Bombay, Tardeo (Hallberg 5398 !), Alibag, sandy shore (Ezekiel !), near Thana (McCann !); banks along railway track between Ghatkopar and Thana, Salsette (McCann !)

W. Ghats : Castle Rock (Bhude !), Londa, common (McCann !).

S. M. Country : Shiggaon (Sedgwick 2353 !), Devarayi (Sedgwick & Bell !).

N. Kanara : Halval (Talbot 1896 !).

Ecology : For excellent detailed notes on this species see R. S. Hole, On some Indian Forest Grasses and their Oecology, in Ind. Forest Mem. I (1911) 96-101.

Distribution : Hotter parts of India, ascending in the Himalayas to at least 6,500 ft., Mediterranean region, Africa, Java, Japan, China, Australia.

Economic uses : Duthie says of this grass that "cattle relish it." "In Australia," he says, "it is called 'blady grass' and the young succulent foliage which springs up after the occurrence of a fire is much relished by stock. I have observed the same effect resulting from periodical fires on certain parts of the Himalaya where this grass is plentiful" (Duthie, Fodder Grasses N. Ind. 23). "In India," according to Hole (l.c. 101) "the succulent white stolons are eaten by pigs and areas which have been well worked by pigs in their search for the stolons are not infrequently seen in the forest. It is possible that in some cases the eradication of the species might be cheaply accomplished by the aid of pigs."

This grass is also known as a paper-making material. "The ultimate fibre obtained from this grass is very similar in most respects to Esparto, the yield of bleached fibre being about the same. This is a favourable indication inasmuch as Esparto is one of the best known and most useful sources of supply to the trade. The results obtained from the chemical analysis show that the grass is capable of yielding a good quality of cellulose, suitable in every way for the manufacture of paper." (Agric. Bull. of the Straits and F. M. States VII (1908) 586).

The leaves are largely used for thatching (Hole).

Explanation of Plate 30 : *Imperata cylindrica* Beauv.

1. Flowering panicle
2. Fruiting panicle.

3. Depauperate culm.

a Bearded leaf-insertions.

b Long villi at base of lamina.

4. Ligule of plant shown in fig. 3. (Figs. 1-4 all $\times \frac{1}{2}$).5. Pair of spikelets ($\times 2\frac{1}{2}$).6. and 7. Spikelet showing callus hairs ($\times 3$).

I. Lower invol. glume.

II. Upper invol. glume.

III. Lower floral glume.

IV. Upper floral glume—Palea.—S. S. Stamens.—Ovary. (all $\times 3$).

23. SACCHARUM Linn.

The genus as understood by the latest agrostologists comprises also the species which were formerly described under the genus *Eranthus* Michx. As already remarked by Haines in his Flora of Chota Nagpur the awned upper floral glume of some *Saccharum* breaks down the only distinction between *Saccharum* and *Eranthus*.

Perennial tall herbs. Leaves various.

Panicle large, often silvery-silky and showy; spikelets usually surrounded by long silky hairs from the base, all alike, binate, one sessile, the other pedicelled on the articulate fragile rhachis of panicle racemes, the pedicelled falling from their pedicels, the sessile deciduous together with the contiguous joint of the rhachis and pedicel. Florets 2, the lower reduced to an empty valve, the upper hermaphrodite. The glumes equal, often chartaceous to subcoriaceous towards the base, membranous to subhyaline upwards; the lower glume with inflexed margins and in the sessile spikelet usually with an even number of nerves, upper glume 1-, 3-, or 5-nerved. Valves hyaline, upper with a terminal bristle-like usually straight awn, or mucronate, or mucous, or 0. Lodicules 2, cuneate. Stamens 3. Stigmas laterally exserted. Grain oblong to subglobose; embryo short to half the length of the grain or more; hilum basal.

Species about 8.—Tropical and subtropical.

A. Awn of upper floral glume not or scarcely exserted from spikelets or 0

I. Hairs on callus of sessile spikelet much exceeding the spikelet.

1. Culms not leafy above, under 17 mm. diam.

Leaves under 20 mm broad. Lower involu-
cral glumes ciliate1. *S. spontaneum*.

2. Culms densely leafy above, over 25 mm. diam.

Leaves over 25 mm broad. Lower involu-
cral glumes glabrous2. *S. officinarum*.

II. Hairs on callus of sessile spikelet shorter or not much longer than spikelet

1. Upper involucrel glume of sessile spikelet not villous dorsally

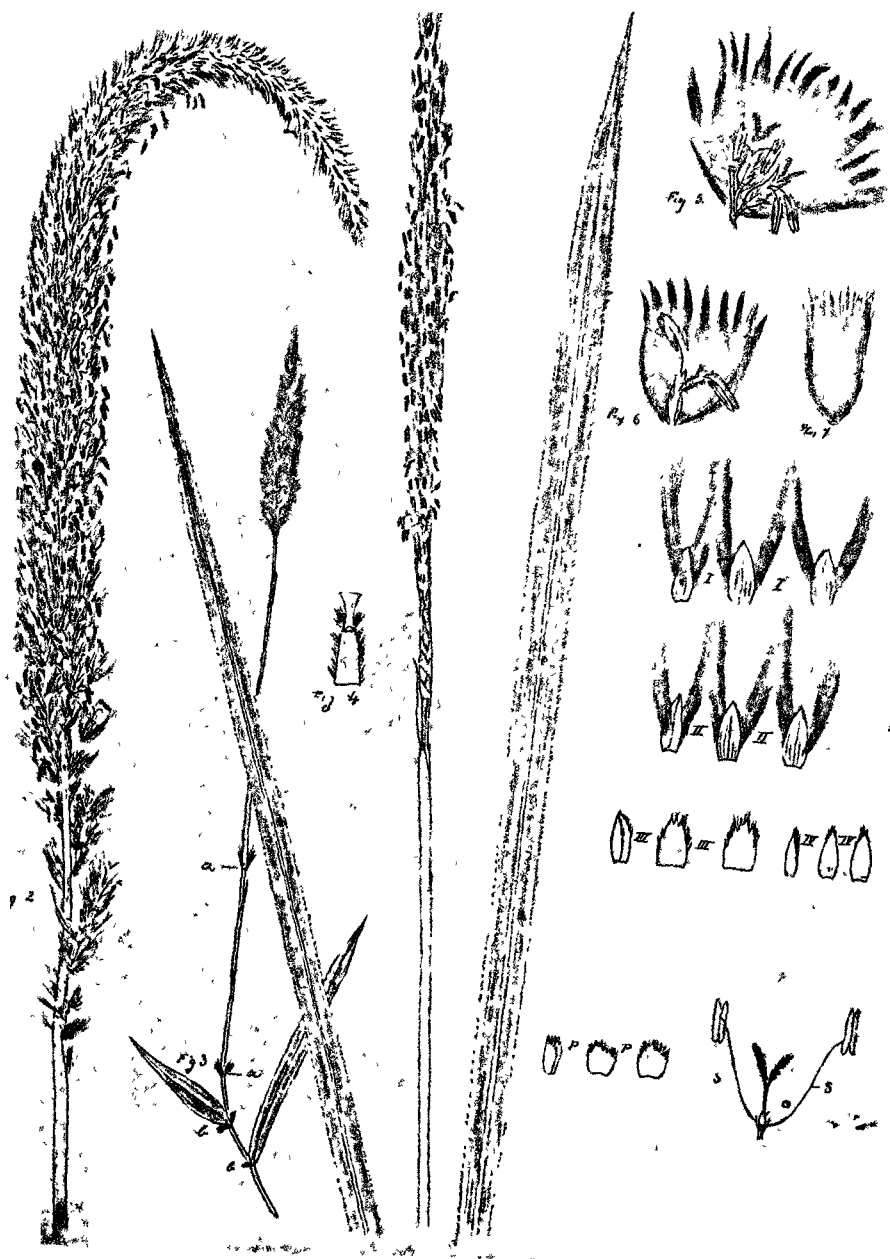
a. Foliage not glaucous. Culms densely
leafy above. Sessile spikelet shorter
than internodes of rhachis3. *S. arundinaceum*.b. Foliage glaucous. Culms not leafy above.
Sessile spikelet longer than internodes
of rhachis4. *S. Munja*.

2. Upper involucrel glume of sessile spikelet villous dorsally

5. *S. Griffithii*.

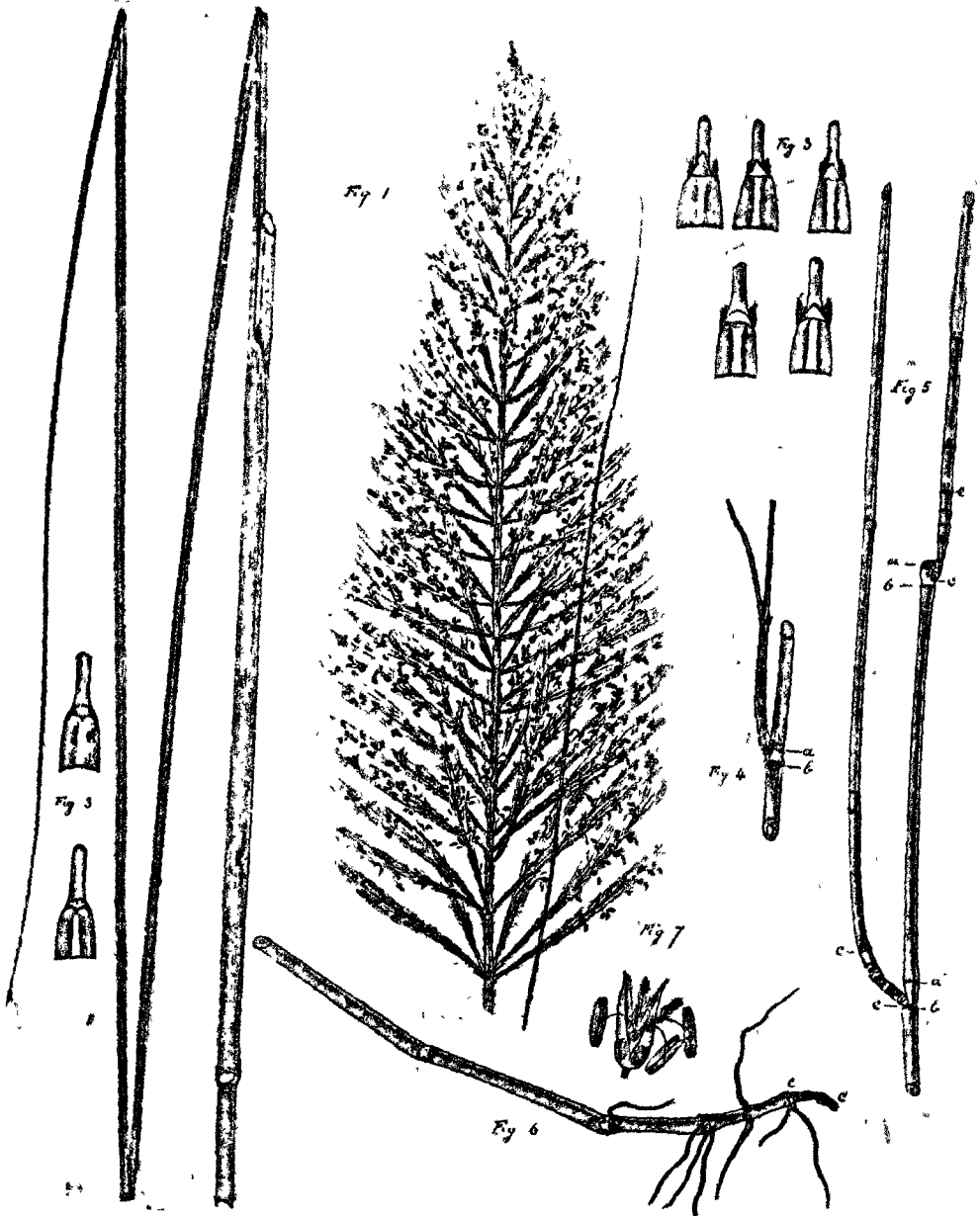
B. Awns of upper floral glume distinctly exserted from the spikelet.

I. Panicles thyrsiform. Spikelets 3-4 mm. long. Awn
2.5 to almost 6 mm long6. *S. Ravennae*.II. Panicles not thyrsiform. Spikelets 4 to almost 5 mm.
long. Awn 8 mm long7. *S. fastigiatum*.



IMPERATA CYLINDRICA BEAUV.

Ex B. S. Hols.



SACCHARUM SPONTANEUM LINN.

Ex B. S. Hols.

1. *SACCHARUM SPONTANEUM* Linn.

PLATE 31.

- Saccharum spontaneum* Linn Mant. (1771) 183; Roxb Fl Ind. I (1832) 235; Griff. Ic. Pl. As. t. 139, fig 63, Dalz & Gibs Bomb Fl (1861) 304; Duthie Grasses N W Ind (1883) 15, Indig Fodder Grasses (1886) 57, Fodder Grasses N Ind. (1888) 25; Hack Monogr. Androp (1889) 113, Lasboa Bomb Grasses (1896) 47, Hook f Fl Brit Ind. VII (1896) 119, Cooke Fl Bomb II (1908) 948; Hole in Ind For Mem. I (1911) 50; Haines Bot. Bih and Or (1924) 1011
- S. spontaneum* var. *aegyptiacum* Hack Monogr Androp. (1889) 115, Stapf in Fl. Trop. Afr. IX (1917) 95.
- S. semidecumbens* Roxb. Fl Ind I (1832) 236.
- S. canaliculatum* Roxb. l. c. 246
- S. chinense* Nees in Hook & Arn Beechey's Voy. 241.
- S. aegyptiacum* var. *sinense* Anders. in Oefvers. K. Vet. Akad. Förhand Stockh. (1855) 157 (non *S. sinense* Roxb.).
- S. spontaneum* Beauv Fl Owar II, 71
- S. biflorum* Forsk Fl Aegypt-Arab. (1775) 16.
- S. aegyptiacum* Willd Enum Hort. Berol I, 82; Boiss Fl. Or V (1884) 454
- S. caducum*, *S. speciosissimum* et *S. Palasotii* Tausch in Flora (1836) 527.
- Imperata spontanea* Beauv Agrost. (1812) 165.

This is a very variable species and Hole does not think that we are justified in making different subspecies or varieties. He distinguishes 3 ecological forms.

- (a) The dry sandy soil-form, a xerophilous type. The culms are slender, erect and tufted, usually less than 5 mm diam. The leaves exceedingly narrow, sometimes only a little more than 1 mm. wide. The callus-hairs not less than $3\frac{1}{4}$ times the length of the spikelet.
- (b) The swamp-form, a hygrophilous type, found in marshes and swamps with an abundance of available moisture more or less throughout the year. The culms are stout, 5-15 mm diam., usually decumbent at base and not tufted. Leaves broad, reaching a width of 17 mm. The callus-hairs $1\frac{1}{2}$ — $3\frac{1}{4}$ times as long as the spikelets. The fruiting panicle elongate-elliptic to oblong with its branches usually more persistent than in other forms.
- (c) The loam-form, intermediate between (a) and (b). The culms are more or less decumbent at the base and not tufted, but less robust and with longer callus-hairs than in (b).

According to Hole the African forms placed under var. *aegyptiacum* differ from the Indian plants chiefly by their slightly larger spikelets. But he finds that this difference is very slight and that it fails in the case of some African specimens. "Considering the great variability of the species in India it seems possible that a more complete knowledge of the African plant will prove *aegyptiacum* to be merely one of the several ecological forms which are defined by inconstant characters and which are connected by numerous intermediates."

Vernacular names : Dharbi, Dhub, Kan, Bochr, Bagberi, Kamis, Khair.

Etymology : *Saccharum* is the Latin word for sugar.

Description : Stem erect or decumbent at the base, reaching up to 6 m. in height and 15 mm in diam., solid above, fistular below, terete, indistinctly striate, usually pruinose when young, polished when old, silky below the panicle and minutely silky below the upper leaf-insertions, glabrous or minutely pubescent below the lower leaf-insertions. Leaf-sheath longer than proper internode, often with reddish or purplish blotches, villous at mouth, often minutely pubescent at base, otherwise glabrous or with scattered appressed hairs, sulcate. Blade erect, of uppermost leaf of flowering culm usually long, varying from 5 cm. to 90 cm. in length, of lower leaves up to 1.2 m. and even 2 m., usually very narrow, often not exceeding 1.5 mm. in width and then consisting of a very narrowly margined concavo-convex midrib, but also attaining a width of 16 mm., glaucous, midrib white, margin scabrid, often villous above at base immediately behind the ligule. Ligule ovate or deltoid, base often subauricled, membranous, subacute or subtruncate, often fimbriate when old, up to 6 mm high. Minutely silky dorsally and ciliate.

Flowering panicle 15-60 cm. long, conical or lanceolate to oblong, branches horizontally spreading, or slightly ascending, usually reddish or purplish, with the callus-hairs closely appressed to the branches of the panicle; primary rachis sulcate, silky with long white hairs; primary branches subverticillate, simple or compound. Spikelets in pairs, one pedicelled and one sessile on the capillary jointed branches and branchlets, awnless, lanceolate, 2-5 mm. long, sessile and pedicelled similar, each one-flowered and hermaphrodite, pedicelled fruiting spikelet falling from the pedicel, the sessile spikelet falling later with the attached pedicel and joint of axis; joint of axis longer or shorter than sessile spikelet, villous on margins, or on margins and

dorsally, pedicel $\frac{1}{4}$ — $1\frac{1}{2}$ the length of the sessile spikelet, but usually shorter than spikelet, glabrous or ciliate, shorter than proper joint; callus-hairs white, from $1\frac{1}{2}$ —7 times as long as sessile spikelets. Lower involucre glume lanceolate, the basal third thickened becoming hard and polished in fruit and more or less brown in colour, the upper two-thirds membranous hyaline, with 2 lateral nerves from which the margin is inflexed; apex entire or minutely bidentate, margin ciliate; dorsally with the upper two-thirds minutely appressed-pubescent. Upper involucre glume broad-lanceolate, similar to the lower, but subkeeled with one central nerve; apex sometimes mucronate, margin inflexed and long ciliate. Lower floral glume hyaline, nerveless, shorter than upper involucre glume, ovate-lanceolate, long ciliate, minutely pubescent above dorsally. Upper floral glume minute, linear, ciliate, hyaline, sometimes 0. Palea minute, ovate, ciliate, often shorter than the lodicules. Lodicules 2, cuneate, glabrous or ciliate at apex. Anthers 3, yellow, turning brown. Stigmas 2, purple.

As good field-characters we may mention the narrow leaves and slender culms, the long callus-hairs and the brown coriaceous base of the involucre glumes.

Locality : *Sind* Shikarpur (Woodrow); Mirpur Sakro (Blatter & McCann D697!).

Gujarat Baroda (Cooke); Domas, near Surat (Dalzell & Gibson).

Khandesh : Dadgaum (McCann 9892!), northern slope of Chanseli (McCann 9893!), Bor, Bori River (Blatter & Hallberg 4422!).

Konkan : Kamana, Mahim (Ryan 2205!); Sakwar, river-side (Ryan ? 2080!), Bassem (Ryan 4!), Karjat (Woodrow), on river-bank (McCann!); Vehar Lake (McCann 9894!), Alibag, sandy shore (Ezekiel!).

W. Ghats : Igatpuri, on banks of bund (McCann 4334!); Castle Rock (Gammie 15743!, McCann!).

Deccan . Poona, river-bank (Woodrow).

S. M. Country Banks of streams, common in the S. Dharwar Dist. (Sedgwick & Bell 3693!), Haveri (Talbot 2236!), Belgaum (Ritchie).

N. Kanara : Supa, bed of Kala Nuddi (Talbot 2196), Hullikal (Talbot 1348!).

Ecology : For extensive notes see R. S. Hole in Ind. For. Mem. I (1911) 54-61.

'The horizontally spreading callus-hairs of the fruiting spikelet form an efficient parachute which aids its distribution by wind. The hairs of neighbouring spikelets becoming entangled together, characteristic flocculent masses of several spikelets are often seen being carried by the wind or hanging on the adjacent vegetation' (Hole).

Distribution of the species, irrespective of the varieties Africa (Upper Guinea, Nile Land, Mozambique District), Lower Egypt, Arabia, Syria, Afghanistan, India, Ceylon, Burma, China, Java, Philippines, New Guinea, Australia.

Economic uses : A favourite fodder of buffaloes. The leaves are used for thatching and brooms. Valuable as a fixing agent for shifting sand and unstable soil. For *S. spontaneum* as a potential source of paper pulp see W. H. Brown and A. F. Fischer, Philippine forest products as sources of paper pulp, in Forest Bur. Philip. Islds. Bull. 16 (1918).

Explanation of Plate 31 : *Saccharum spontaneum* LINN.

1. Flowering panicle ($\times \frac{1}{2}$).
2. Culm and leaf ($\times \frac{1}{2}$).
3. Ligule ($\times \frac{1}{2}$).
4. Portion of culm with axillary shoot.
 - a. Culm-node.
 - b. Leaf-insertion ($\times \frac{1}{2}$).
5. Culms with an erect habit of growth originating from the nodes of an older culm.
 - a. Culm-node.
 - b. Leaf-insertion ($\times \frac{1}{2}$).
6. Base of culm showing the spreading habit of growth.—CC the short internodes at base of culm ($\times \frac{1}{2}$).
7. Flowering spikelet ($\times 6$).

*2. *SACCHARUM OFFICINARUM* LINN.

Saccharum officinarum Linn. Sp. Pl. (1753) 54, Roxb. Fl. Ind. I (1832) 237; Beauv. Agrost. Expl. Planch. 5, t. IV, fig. 10; Hack. Monogr. Androp. (1889) 111, Hook. f. Fl. Brit. Ind. VII (1896) 118, Lisboa Bomb. Grasses (1896) 47, Cooke Fl. Bomb. II (1908) 948, Stapf in Fl. Trop. Afr. IX (1917) 96; Haines Bot. Bih. and Or. (1924) 1012.

Vernacular names : Sugarcane, Us, Serdi, Ganderi, Usa, Kabbu, Kamand, Sherndi, Skerdi.

Etymology : *Officina* means drug-shop.

Description : Stems up to 6 m. high, many-noded, glabrous or pubescent below the panicle, more or less coated with wax below the nodes. Leaf-sheaths tight, terete, smooth, glabrous except when young, ligules very short, membranous, ciliate, blades linear-lanceolate, up to 1.5 m. long, and over 5 cm. broad, green above, glaucous below, more or less scabrid along the margins, midrib very stout, rounded on the back, more or less flat above.

Panicles pyramidal, up to 1 m. long, dense, silvery, primary rachis glabrous except on the pubescent nodes, or more or less silky, primary branches verticillate or semiverticillate, very slender, glabrous or hairy. Racemes up to 10 cm. long, very fragile; joints and pedicels filiform, more or less ciliate or glabrous, the joints variable in length, the pedicels much shorter. Spikelets lanceolate, up to 4.2 mm. long, surrounded from the callus by a tuft of long silky hairs up to 10 mm. long. Involucral glumes subequal, lanceolate, firm towards the base, otherwise subhyaline, the lower acute, 2-nerved to sub-4-nerved, glabrous, the upper very similar, 1-3-nerved, glabrous or ciliate. Lower floral glume oblong, acute or subacute, hyaline, nerveless, ciliate, about 3.3 mm. long, upper floral glume subacute, ciliate, as long as the lower or 0. Palea, if present, very minute, obovate, ciliate. Lodicules broad, cuneate, sparingly ciliate from the top. Stigmas purplish, 2.1 mm. long. Grain oblong, attenuated upwards, subterete, flesh-coloured, embryo $\frac{1}{2}$ the length of the grain.

Varieties and races : See Watt, Commercial Prod. of India (1908) 933, Imperial Gazetteer III, 39.

Locality : Grown throughout the Presidency. It occupies an area of about 60,000 acres.

Ecology : Always an irrigated crop in Bombay. Heavy manuring and regular watering are required. It does best on level well drained soils.

Distribution : There are many indications that S. Asia is the original home of the sugar-cane.

For details see A. De Candolle, Origin of Cultivated Plants 2nd ed (1909) 154-60; Géogr. Bot. Raisonnée p. 739, K. Rutter, Ueber die Geographische Verbreitung des Zuckerrohrs, 108 pages (not dated).

Economic uses : For sugar, food and fodder see Watt, Dict. Ec. Prod. India VI, pt 2 (1893) 5, Commercial Prod. of India (1908) 930 ff; Kruger, Das Zuckerrohr und seine Kultur, 1899.

Medicinal uses : See Bentley and Trimen, Medicinal Plants, and Dymock, Pharm. Indica III, 592.

Diseases : For the various fungoid diseases to which the Sugarcane is subject see E. J. Butler, Fungi and Disease in Plants (1918) 377-412.

*3. SACCHARUM ARUNDINACEUM Retz.

Saccharum arundinaceum Retz. Obs. bot. fasc. IV (1786) 16, Hack. Monogr. Androp. (1839) 117 (excl. syn. *S. exaltatum*), Hook f. Fl. Brit. Ind. VII (1896) 119 (excl. syn. *S. ciliare* Anders., *S. exaltatum* Roxb., *S. munja* Roxb., *S. Sara* Roxb.); Cooke Fl. Bomb. II (1908) 948 (excl. syn. *S. exaltatum* Roxb.); Haines Bot. Bih. and Or. (1924) 1012.

S. bengalense Retz. l. c. 16.

S. procerum Roxb. Fl. Ind. I (1832) 243.

Vernacular name : Kerpa.

Etymology : *Arundinaceum*, having the habit of *Arundo*, a reed.

Description : A gigantic tufted grass. Culms biennial (? or triennial), somewhat with the habit of the sugarcane, branched, often 5 m. high, the flowering culms sometimes nearly 9 m. high and over 18 mm. diam., solid. Stem glabrous, smooth, or slightly rough with very long internodes. Blade reaching 1.8 m. in length and 5 cm. in breadth, with rib stout and as broad as the blade at base, keeled below, villous with long silky hairs above, margins cutting. (According to Hole the midrib in basal leaves occupies at base $\frac{1}{2}$ or less of the width of the blade.) Upper cauline leaves becoming folded and filiform. Leaf-sheaths glabrous. Ligule truncate with a ring or tuft of long silky hairs 6-25 mm. distance from its base.

Panicle 60 cm. to 1.2 m. long, pink, white or silvery, diffuse while flowering, with smooth glabrous axis, main branches tufted on the axis, tufts alternate or subverticillate. Spikelets 2.5-3.7 mm. long, much shorter than the internodes of the spike. Pedicel $\frac{1}{2}$ to equal the length of the sessile spikelet. Joint usually longer than sessile spikelet; majority of pedicels shorter than proper joint. Callus-hairs pale, not dense, as long as spikelet (according to Hole shorter than or subequal to spikelet). Hairs of joint overtop the joint by less than to $1\frac{1}{2}$ times the length of the joint. Sessile spikelet: lower involucral glume chartaceous, dorsally sparsely villous, villi overtopping the glume by about $1\frac{1}{2}$ the length of the glume. Upper involucral glume chartaceous, not villous dorsally. Lower floral glume not villous dorsally. Mucro of upper floral glume not exerted beyond apex of spikelet. Pale ciliate. Pedicelled spikelet;

involucral glumes dorsally villous, villi overtopping spikelet by $1-1\frac{1}{2}$ times the length of the spikelet. Spikelet sometimes 2-3-flowered with 1-2 additional paleate glumes inside the floral glumes.

Locality : Cultivated in gardens.

Distribution : Bengal, Assam, Burma, extending into China. It is a native of the ever-green zone of India characterized by a rainfall exceeding 70 in., but is frequently cultivated in gardens throughout India (Hole).

Economic uses : The stems being long, strong and straight, are used by the Indians for screens and other economical purposes.

4. *SACCHARUM MUNJA* Roxb.

PLATE 32.

Saccharum Munja Roxb. Fl. Ind. I (1832) 246; Hole in Ind. For. Mem. I (1911) 62; Haines Bot. Bib. and Or. (1924) 1013.

S. Sara Roxb. Fl. Ind. I (1832) 244.

S. cihare Anders in Oefvers. K. Vet. Akad. Förhand. Stockh. (1855) 155; Hack. Monogr. Androp. (1889) 118 (excl. vars. *Griffithii* et *Boissierii*).

S. arundinaceum Hook. f. Fl. Brit. Ind. VII (1896) 119 (*partim*).

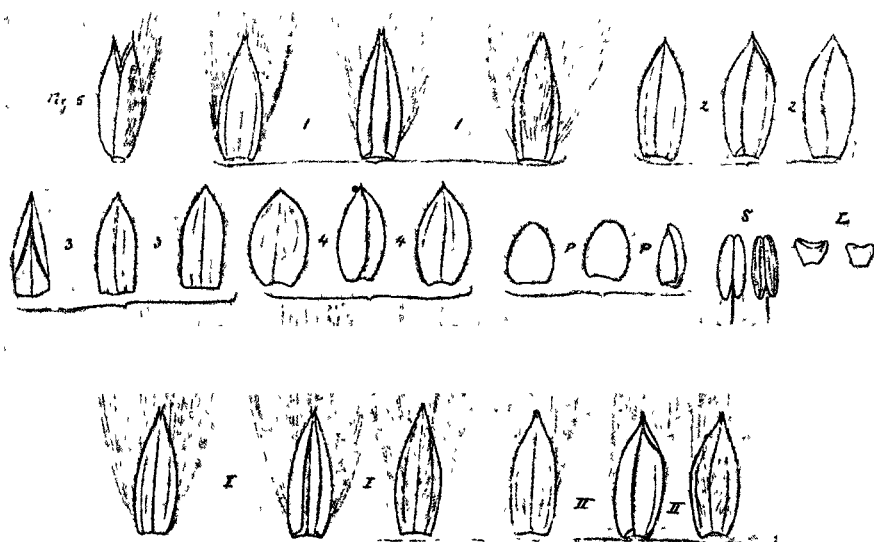
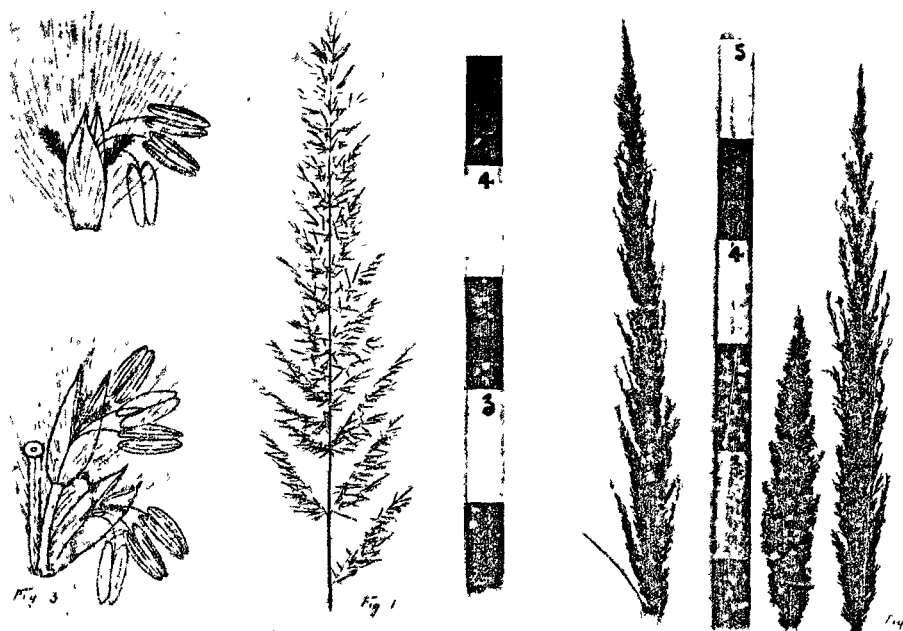
S. arundinaceum var. *cihare* Haines in Fl. Chota Nagpur (1910).

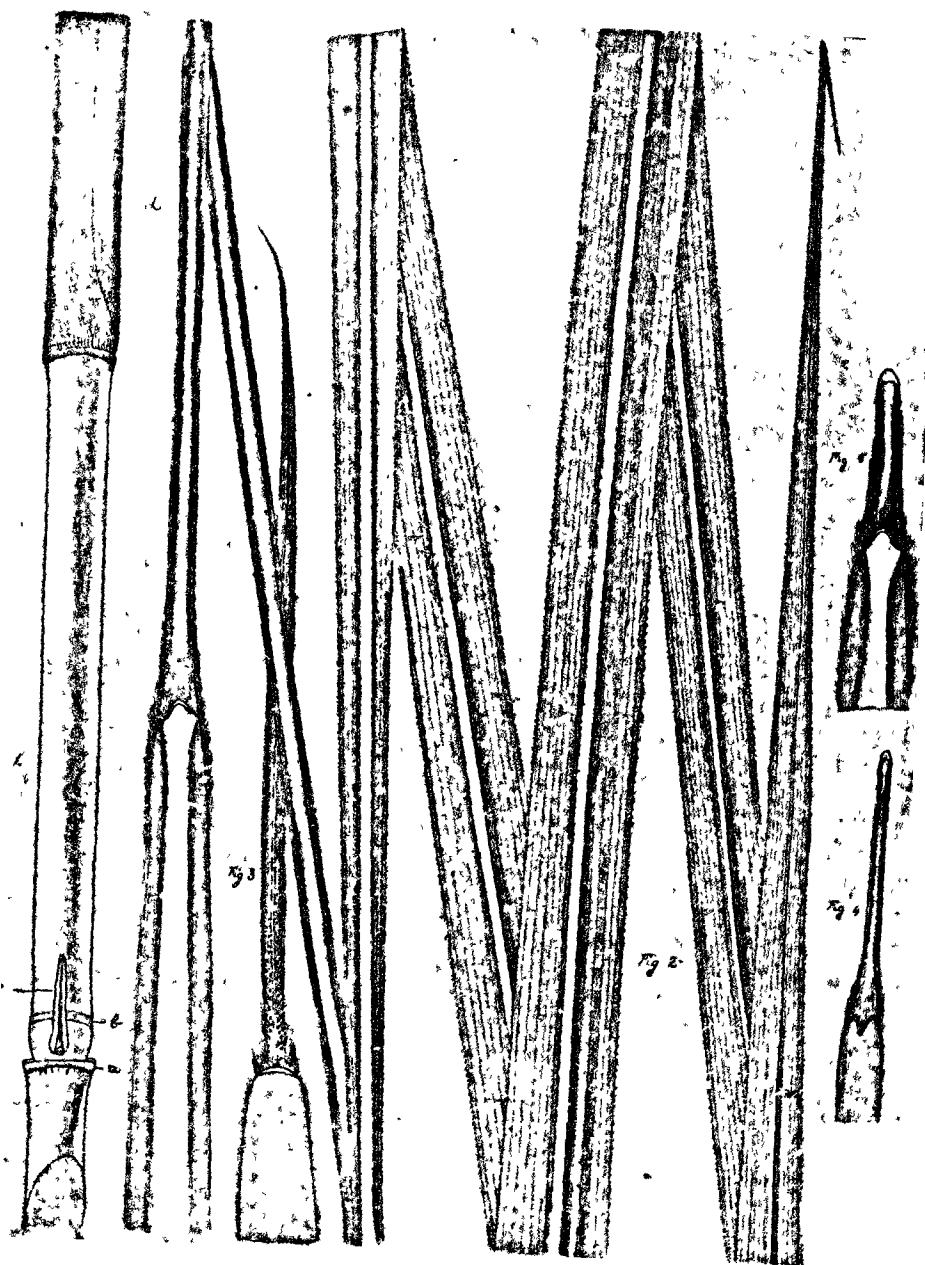
Vernacular names : Munj, Munja, Sar.

Etymology : The specific name was taken by Roxburgh from the vernacular name *Munja*. (See Asiat. Res. IV, 248).

Description : An erect grass, attaining a height of 5.5 m. and 12 mm. diam., pale straw-coloured, smooth, striate, solid. Leaf-sheath shortly silky at extreme base, otherwise quite smooth, striate, pale straw-coloured, villous on margins at apex with long white hairs, usually much longer than proper internode, uppermost sheath sometimes extending beyond the base of the panicle. Upper leaf of flowering culm 22-70 cm. long, flat, tapering from the base, long-acuminate, 5-10 mm. broad. Lower leaves up to 2 and 2.4 m. by 25 mm., but usually only 18 mm. broad. In basal leaves the concave midrib occupies $\frac{1}{2}$ or more of width of blade. Colour glaucous, midrib white. Margin scabrid as are one or more intramarginal nerves below, otherwise smooth, but densely white villous at base behind the ligule. Ligule truncate, usually a narrow membranous rim, of upper leaves longer, attaining 3 mm., minutely silky dorsally and ciliate.

Flowering panicle 30-90 cm. long, usually lanceolate, pale cream-coloured to dark reddish-purple, branches spreading. Fruiting panicle oblong, branches appressed to the axis, white to greyish white. Primary rhachis glabrous, sulcate, more or less scabrid on the ridges. Primary branches subverticillate, compound. Ultimate branchlets triquetrous, more or less villous with long white hairs on angles and on two faces. Spikelets in pairs, one pedicelled and one sessile on the capillary jointed branches and branchlets of a terminal panicle, awnless, lanceolate, up to 5 mm. long, sessile and pedicelled similar, each one-flowered and hermaphrodite. Pedicelled fruiting spikelet falling from the pedicel, the sessile spikelet falling later with the attached pedicel and joint of axis. Joint of axis triquetrous, $\frac{1}{2}$ to subequal the sessile spikelet, but usually shorter than the spikelet, villous on two faces and on margins, the villi overtopping the joint by once to twice the length of the joint. Pedicels triquetrous, $\frac{1}{2}$ to $\frac{2}{3}$ the length of the sessile spikelet, villous with long white hairs on two faces and on the angles. Most pedicels shorter than proper joint, rarely subequal to the proper joint. Sessile spikelets; lower involucrel glume lanceolate, chartaceous, with 2 strong lateral nerves and usually 1-4 more or less distinct additional nerves, dorsally long villous on basal half or two-thirds, the hairs overtopping the glume by about the length of the glume, scabrid dorsally on keels, margin inflexed, sparsely ciliate above, apex minutely bidentate to entire. Upper involucrel glume subequal to the lower, lanceolate, chartaceous, keeled, with one strong central nerve and usually 2-4 more or less distinct additional nerves, glabrous dorsally or minutely pubescent towards apex, scabrid dorsally on keel, margins incurved, ciliate above, apex usually shortly mucronate. Lower floral glume oblong-lanceolate, hyaline-membranous, or little shorter than the upper involucrel glume, 1-3-nerved, margins incurved, ciliate, apex acute or short mucronate. Upper floral glume broad-lanceolate to elliptic, shorter than or subequal to the upper involucrel glume, hyaline, 1-3-nerved, mucronate, ciliate, mucro short to 1.25 mm. long, but not exerted beyond the apex of the spikelet. Palea ovate, hyaline, ciliate, from $\frac{1}{2}$ to $\frac{2}{3}$ the length of the upper floral glume. Pedicelled spikelets similar, but both the involucrel glumes are dorsally long villous and usually with 3-5 strong nerves and occasionally 2 additional fainter ones. Lodicules 2, cuneate, glabrous, 0.5 mm. long. Anthers 3, pale yellow to purple, 2-2.5 mm. long. Stigmas yellow, often tinted with purple, 1-1.5 mm. long.





SACCHARUM RAVENNAE LINN.

To distinguish this species from *Saccharum Ravennae* Holt gives the following field-characters : Glaucous narrow leaves, awnless spikelets, smooth leaf-sheaths

Locality : *Sind* (Stocks in Herb Boiss *ex* Hackel).

Gujarat (Sedgwick and Saxton).

Ecology : This plant shows marked xerophylous adaptations. Although it attains its maximum development in moist sand, it thrives in typically xerophylous places. It does best on alluvial sandy deposits in the neighbourhood of streams where the soil is not water-logged. For further ecological notes, especially on the susceptibility to fire damage see Hole in Ind. For. Mem. I, 71-78

Distribution : Northern India in the Punjab and Upper Gangetic Plain, Sind and Gujarat.

Economic uses : The fibre of the upper leaf-sheaths is used for mats, ropes, etc. It has also been favourably reported on as a paper material. (Haines). "At Jeypor it is extensively used as a sand-binding plant." (Duthie). See Hole 78, 79.

Explanation of Plate 32 : *Saccharum Munga* Roxb.

1. Flowering panicle.
2. Three fruiting panicles
3. Pair of spikelets with joint of axis ($\times 6$).
4. Pedicelled spikelet ($\times 6$).
5. Sessile spikelet ($\times 6$).
- 1-4. Sessile spikelet
 1. Lower invol. glume.
 2. Upper invol. glume.
 3. Lower floral glume.
 4. Upper floral glume (all $\times 6$).
- PP. Palea ($\times 6$).
- S. Anthers ($\times 6$)
- L. Lodicules ($\times 6$).
- I. Lower invol. glume of pedicelled spikelet.
- II. Upper invol. glume of pedicelled spikelet ($\times 6$).

5. SACCHARUM GRIFFITHII Munro.

Saccharum Griffithii Munro *ex* Aitchis. in Journ. Linn. Soc. XIX (1922) 191; Hole in Ind. For. Mem. I (1911) 68-70.

S. Sara Aitchis. l. c. 191; Boiss. Fl. Or. V (1884) 453.

? *S. Griffithii* Boiss l. c. 453

S. ciliare var. *Griffithii* Hack. Monogr. Androp. (1889) 119.

Erianthus Griffithii Hook. f. Fl. Brit. Ind. VII (1896) 122 (*partim*).

Etymology : *Griffithii* after Wilham Griffith (1810-45), one of the greatest botanists in India.

Description : A caespitose grass Culms 2 m. high or slightly higher, solid. Blade glaucous, narrow, about 8 mm. wide, midrib at base usually occupies $\frac{1}{2}$ or more of width of blade; sheath not hirsute, nodes not bearded. Rhachis of racemes fragile.

Spikelets 2 at each node of the rhachis, one sessile and finally deciduous with the accumbent joint, the other pedicelled, finally separating from the pedicel, both 1-flowered, hermaphrodite. Spikelets 4-6 mm. long, muticous; pedicel $\frac{1}{2}$ - $\frac{3}{4}$ the length of the sessile spikelet, joint $\frac{1}{2}$ - $\frac{3}{4}$ the length of the sessile spikelet. Most pedicels subequal to longer than proper joint; callus-hairs yellow, shorter than to subequal to the spikelet; hairs of joint overtopping joint by once to twice the length of joint. Sessile spikelet: lower involucrel glume chartaceous, dorsally densely villous in basal $\frac{1}{2}$, villi not overtopping the glume, or overtopping by less than $\frac{1}{2}$ the length of the glume. Upper involucrel glume chartaceous, dorsally villous in basal $\frac{1}{2}$ or $\frac{3}{4}$ villi not overtopping or overtopping by less than $\frac{1}{2}$ the length of the glume. Lower floral glume sometimes sparsely villous dorsally. Upper floral glume with a very short mucro, 1.5 mm. long, not exerted beyond apex of spikelet. Palea ciliate. Pedicelled spikelet. Involucrel glumes dorsally villous in basal $\frac{1}{2}$ - $\frac{3}{4}$, villi not overtopping or overtopping by less than half the length of the spikelet; no additional glumes inside the floral glumes.

Locality : *Sind* Near Hyderabad (Blatter & McCann D698 l); W. of Tatta (Blatter & McCann D699 l), near Karachi (*ex* Hackel l. c.).

Ecology : In his paper on the Kuram Valley Aitchison writes : "Along the edges of the dry watercourses, and on the higher island-like plots of ground in the beds of these dried-up streams, *Saccharum Griffithii*, a great coarse stiff grass, occurring in large tussocks, is very striking, owing to the absence of other vegetation generally than to any peculiarity of its own."

Distribution : Kuram valley, Baluchistan, Punjab, Sind.

6. *SACCHARUM RAVENNAE* LINN.

PLATE 33.

Saccharum Ravennae Linn. Syst. ed. XIII, 88; Sibth. & Sm. Fl. Graeca t. 52; Reichb. Ic. Fl. Germ. fig. 1505; Stapf in Fl. Trop. Afr. IX (1917) 97; Haines Bot. Bih. & Or. (1924) 1014. *Erianthus Ravennae* Beauv. Agrost. (1812) 162; Hook. f. Fl. Brit. Ind. VII (1896) 121; Stapf in Kew Bull. (1907) 208; Nees Gen. Fl. Germ. t. 90; Boiss. Fl. Or. VI (1884) 455; Duthie Grasses N. W. Ind. (1883) 15; Fodder Grasses N. Ind. (1888) 26; Cooke Fl. Bomb. II (1908) 949; Hole in Ind. For. Mem. I (1811) 87.

Andropogon Ravennae Linn. Sp. Pl. ed. II, 1481; Host Gram. Austr. III, 1, t. 1.

Rapidum Ravennae Trin. Fund. Agrost. (1820) 169.

Saccharum jamaicense Trin. in Mém. Acad. Petersb. sér. 6, II (1833) 312.

Etymology : The specific name refers to Ravenna, a town in Upper Italy.

Description : Culms erect, up to 6 m. high and 17 mm. thick, solid, often slightly fistular just below the panicle, smooth and polished, striate, shortly and finely bearded at the leaf insertions. Leaf-sheath hirsute with bulbous-based hairs, the latter varying in colour from white to yellow or brown, the hairs being more or less deciduous and old sheaths are often rough with the persistent bulbous bases; upper sheaths glabrescent, always longer than the proper internode, long ciliate on margin towards the apex. Blade of uppermost leaf of flowering culm from 20 cm. long and 6 mm. wide, linear and tapering from base, to 75 cm. long and 16 mm. wide with greatest width about the middle; lower leaves usually 1.2–1.5 m. long and 25 mm. wide, but also attaining a length of 1.8 m. and width of 38 mm., broadest about the middle, sometimes in upper third, dark green, midrib white, apex acuminate, narrowed towards the base, in basal leaves the concave midrib occupies $\frac{1}{3}$ or more of width of lamina at base, often the entire width of the leaf, densely villous above towards the base with bulbous-based hairs, more or less scaberrulous along nerves, margins scabrid. Ligule a narrow membranous rim not longer than 1.75 mm., entire, rounded or deeply 2-lobed, patently hairy dorsally with stiff white hairs, ciliate.

Panicle 30–90 cm. long, lanceolate, dense or somewhat lax and lobed, silvery silky, with a tinge of grey and purple, or quite white; primary rachis sulcate, glabrous, smooth below, scabrid on the ridges; branches slender, solitary from the distant nodes, divided from the base, up to 20 cm. long, branchlets unequal, divided again, glabrous except at the nodes. Racemes sessile or the lower more or less peduncled, narrow to oblong, joints and pedicels filiform, long-ciliate, with thickened tips, the latter shorter than the joints. Callus-hairs shorter than to subequal to length of spikelet, purplish or brownish. Sessile spikelet lower involucreal glume lanceolate with 2 lateral keels, dorsally flat or depressed between the keels, apex 2-mucronulate, one or both margins incurved, dorsally scabrid on keels, otherwise glabrous, or more or less villous dorsally, villi not overtopping the glume, or overtopping by less than $\frac{1}{2}$ the length of the glume; 2-nerved, sometimes with 1–2 additional faint nerves between the keels. Upper involucreal glume subequal to the lower, with a central keel, mucronate, margin incurved; ciliate, dorsally scabrid on keel, otherwise glabrous or more or less villous dorsally, villi not overtopping the glume, or overtopping by less than $\frac{1}{2}$ the length of the glume, 1-nerved and sometimes 1 or 2 partial lateral nerves. Lower floral glume slightly shorter than upper involucreal glume, oblong-lanceolate, hyaline, apex mucronate or acute, dorsally glabrous, margin incurved, ciliate above, 1–3-nerved. Upper floral glume usually $\frac{2}{3}$ the length of the lower, ovate-lanceolate, hyaline, margin incurved, ciliate, long-awned, awn 2.5–6 mm. long, 3-nerved. Palea about $\frac{2}{3}$ the length of the upper floral glume, ovate-lanceolate, hyaline, glabrous, nerveless. Lodicules 2, cuneate, glabrous. Anthers 3, yellow, streaked with purple. Stigmas yellow. Pedicelled spikelet like the sessile, but involucreal glumes often strongly 3-nerved and hairy.

Can easily be distinguished from *Saccharum Munja* by its distinctly awned spikelets, the broader dark green leaves and hairy leaf-sheaths (Hole).

Locality : Sind Laki (Bhide !); Khairpur Mirs, sandy plain (Sabnis B226 !); Sehwan (Sabnis B36 ! B664 !); Larkana (Sabnis B444 !, Cooke), Pad-Idan (Sabnis B498 ! B509 !); Sukkur (Sabnis B552 !), Nasarpur, sandy plains (Sabnis B1049 !), Umarkot, sandy plains (Sabnis 1211 !), Sanghar (Sabnis B900 !); Jamesabad (Sabnis B968 !); Phuleli, canal, on banks (Sabnis B195 !); Mirva Canal, sandy banks (Sabnis B258 !), Khairpur, forests (Sabnis B329 !); Sita Road (Sabnis 367 !), Sehwan to Laki, foot of hills (Sabnis B601 B111 !); Mirpur Sakro (Blatter & McCann D694 !), Chuar Chemali (Blatter & McCann D695 !), Indus Delta (Blatter & McCann D696 !), Karachi (Cooke, Woodrow).

Decan : Poona, College garden (Garade !).

Ecology : Found on sandy and clayey loam. Requires a liberal supply of available moisture (See Hole p. 90, 91).

Distribution : W. Himalaya, Punjab, Upper Gangetic Plain, Sind, extending westwards to the Mediterranean.

Economic uses : The culms are used for making screens, etc. The leaves quickly decay and are therefore useless for thatching.

The leaves, especially when young, are eaten by buffaloes to some extent.

Explanation of Plate 33 : *Saccharum Ravennae* Linn.

1. Culm :

- a. Leaf-insertion.
- b. Culm-node.
- c. Axillary bud.
- d. Base of hairy leaf-sheath.

2. Lower leaf.

3. Uppermost leaf of flowering culm.

4 & 5. Base of lamina and top of leaf-sheath showing the concave midrib and ligule.

(All figs. $\times \frac{1}{2}$).

7. *SACCHARUM FASTIGIATUM* Steud.

Saccharum fastigiatum Steud. Syn. Pl. Glum. (1855) 409; Haines Bot. Bih. and Or. (1924) 1014; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 288.

Erianthus fastigatus Nees ex Steud. l. c.; Hack Monogr. Androp (1889) 150; Hook. f. Fl. Brit. Ind. VII (1896) 125; Cooke Fl. Bomb. II (1908) 949.

Etymology : *Fastigiatum* has here the same meaning as fasciate, alluding to the fascicled racemes.

Description : Stem 0.6-2.4 m. high, stout or slender, silky-hairy below the panicle. Leaves 2.5-5 cm. by 4-6 mm., linear from a narrow base, rigid, flat, smooth, with scabrid margins; sheaths glabrous, with fimbriate mouth, ligule a narrow membrane.

Panicle oblong or fan-shaped; racemes crowded, subdigitately fascicled, rhachis angular, silky-hairy. Spikelets 5 mm. long, lanceolate, dark brown below, paler above; callus with white hairs which are much shorter than the spikelet; pedicels as long as the spikelets, with 2 opposite rows of silky hairs. Glumes 4; lower involucrel glume 5 mm. long, chartaceous, brown, shining, ovate-lanceolate, acute, the margins near the base clothed with long silky hairs; upper involucrel glume chartaceous, lanceolate, acuminate, brown below, paler above, equalling the lower involucrel glume; lower floral glume 4 mm. long, narrowly lanceolate, acute, base membranous, coloured, the upper part hyaline, upper floral glume 2.5 mm. long, lanceolate, 2-toothed, hyaline, with a slender awn 6 mm. long or longer.

Locality : S. M. Country : Belgaum (Ritchie 792).

Distribution : Sikkim, Khasia, Assam, Bengal, Chota Nagpur, Orissa, W. Peninsula.

24. *SPODIOPOGON* Trin.

Tall grasses. Leaves often with long petioles.

Spikelets 1-2-flowered, paniculate, laterally compressed or subterete, 2-3-nate; lower sessile, male; upper 2-sexual; rhachis jointed. Glumes 4, involucrel glumes subequal; lower involucrel glume lanceolate, 5-9-nerved, with an acuminate or toothed tip, upper involucrel glume membranous, lanceolate, 3-7-nerved, lower floral glume hyaline, paleate or not, triandrous or empty, upper floral glume 2-fid or 2-partite, with a very slender exerted awn in the sinus; palea shorter than the glume. Lodicules cuneate. Anthers linear. Stigmas linear. Grain free, narrowly fusiform.

Species about 8.—Asia.

1. *SPODIOPOGON ALBIDUS* Benth.

PLATE 34.

Spodiopogon albidus Benth. in Journ. Linn. Soc. XIX (1881) 66; Hack. Monogr. Androp. (1889) 185; Hook. f. Fl. Brit. Ind. VII (1896) 108; Cooke Fl. Bomb. II (1908) 947.

Andropogon rhizophorus Steud. Syn. Pl. Glum. (1855) 381; Duthie Fodder Grasses N. Ind. (1888) 26.

A. petiolatus Dalz. Bomb. Fl. (1861) 303.

Etymology : *Spodiopogon* is derived from *spodos*, ashes, dust, and *pogon*, beard, therefore ash-grey beard, referring to the silky-hairy involucrel glumes.

Description : A weak straggling tufted annual grass 60-120 cm. high; stem slender, much-branched, leafy. Leaves 15-25 cm. by 6-20 mm., oblong-lanceolate, acuminate, 1-nerved, usually suddenly narrowed into a slender petiole 2.5-7.5 cm. long; sheaths 15 mm. long; ligule oblong, glabrous.

Panicle at first enclosed in a long narrow spathaceous leaf-sheath; rhachis compressed, ciliate. Spikelets reaching 5 mm. long, lanceolate, silky-villous, one pedicellate, the other sessile; pedicels 2.5 mm. long, spatulate, flattened, ciliate. Glumes 4, involucrel glumes equal, ovate-lanceolate, finely mucronate, silky-hairy, 7-nerved, lower floral glume truncate, with erose tip, hyaline, upper floral glume 4 mm. long, deeply divided at the apex into 2 very acute lobes, awn reaching 13 mm. long, slender.

Easily distinguished by its purple stems, woolly panicles and sagittate leaves.

Locality : *Khandesh* Toranmal (McCann 9886 ' 9888 !)

Konkan Warsai, near Pen (Bhide !); Pen (McCann 5374A !), Bandra, below Pali Hill (Ryan !), Tungar, Bassem (Bhide !); Salsette (Jacquemont 708).

W. Ghats (Woodrow 157); Igatpuri, common (McCann 4327 !); Matheran (Cooke), Harrison's Springs (D'Almeida A242 !); Khandala, very common (McCann 9401 !); Khandala to Karjat (Blatter & Hallberg 5325 !); Lonavla (Bhide !, McCann !, Woodrow); Mahabaleshwar (Cooke); Mahabaleshwar to Pratapgad (Bhide 1182 !).

Deccan Kirkee, Ganeshkhind Bot. Gardens (Gammie !), Sinhagad Forest, Poona Dist. (Bhide !), Lohagad, upper half (McCann 9437 !); Purandhar Fort (McCann 5004 !).

S. M. Country : Derikop, forest (Sedgwick 1862 !)

N. Kanara : (McCann !); Arbail Ghat (Sedgwick & Bell 3168 !); Supa (Talbot 279 !).

Ecology : A subgregarious plant. A forest grass, very abundant in N. Kanara and Mahabaleshwar forests. A monsoon plant, coming into flower about the last week of September.

Distribution : Central Provinces, Rajputana, W. Peninsula.

Explanation of Plate 34 : *Spodiopogon albidus* Benth.

- | | |
|---|--------------------|
| 1. Spikelets. | } Sessile spikelet |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Palea of lower floral glume and styles | |
| 6. Upper floral glume. | |
| 7. Palea of upper floral glume. | |
| 8. Grain and styles. | |

25. EULALIA Kunth.

(Formerly under *Pollinia* Trin.)

Perennial. Culms simple, erect or ascending. Leaf-blades convolute in bud, then flat, usually narrow, gradually passing into the sheath.

Racemes often coloured (brown or purplish). Spikelets all alike or nearly so, 2-nate, one sessile, the other pedicelled, on the articulate fragile rhachis of 2-nate, digitate or fascicled spike-like racemes, the pedicelled falling from their pedicels, the sessile deciduous together with the contiguous joint of the rhachis and the pedicel. Florets typically 2; lower reduced to an empty floral glume or represented by a minute scale or quite suppressed; upper always hermaphrodite. Involucrel glumes equal, rigidly membranous to coriaceous, lower dorsally flattened or shallowly concave (not grooved), more or less 2-keeled with inflexed margins; upper 1-3-nerved, keeled. Floral glumes hyaline, lower mucous, sometimes much reduced or quite suppressed, upper very short, 2-lobed, awned. Paleae small or 0. Lodicules 2, small, cuneate. Stamens 3. Stigmas linear, laterally exerted. Grain oblong, embryo almost half the length of the grain or longer; hilum basal, punctiform.

Species about 25.—Tropical and subtropical regions of the Old World.

- | | | | | | | |
|-----------------------|---|---|---|---|---|--------------------------|
| 1. Racemes many, 6-12 | . | . | . | . | . | 1. <i>E. argentea</i> . |
| 2. Racemes few, 2-4 | . | . | . | . | . | 2. <i>E. fimbriata</i> . |

1. EULALIA ARGENTEA Brogn.

PLATE 35.

Eulalia argentea Brogn. Voy. Coy. Bot. 92; Haines Bot. Bih. and Or. (1924) 1018; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 290.

Pollinia argentea Trin. in Bull. Sc. Acad. Petersb. I (1836) 71; Hack. Monogr. Androp. (1889) 162; Lisboa Bomb. Grasses (1896) 47; Hook. f. Fl. Brit. Ind. VII (1896) 111; Cooke Fl. Bomb. II (1908) 950.



SPODIOPOGON ALBIDUS BENTH.

Dein: R. K. Blida.



EULALIA ARGENTEA BROGN.

Des: E. K.

P. tristachya Thw. Enum. Pl. Zeyl. (1864) 363 (*partim*); Duthie Fodder Grasses N. W. Ind. (1883) 26, t. 53.

Eranthus rufus Nees ex Steud. Syn. Pl. Glum. (1855) 409 (*partim*).

E. hexastychus Hochst in Hohen. Pl. Ind. Or. no. 279

E. Rozburghii F. Muell. Ffagn. Phyt. VIII, 117

Saccharum rufum et tristachyum Steud. l. c. 408 (*partim*).

Andropogon minutiflorus et hexastachyus Steud. l. c. 379, 380.

A. trispicatus Schult. Mant. II, 452.

A. tristachyus Roxb. Fl. Ind. I (1832) 256

Vernacular names : Roira, Chota kussal, Krer.

Etymology : *Eulalia* is a proper name.—*Argentea* means silvery.

Description : Perennial, stems tufted 45-120 cm. high, stout or slender, erect, simple or branched, smooth, shining, leafy at the base and upwards, nodes glabrous. Leaves 15-45 cm. by 1.2-5 mm., erect, narrowly linear, rigid, often filiform, glabrous, striate, tips capillary; sheaths long, slender, coriaceous, not auricled at the mouth, the sides bearded with long hairs; ligule a short membrane fringed with long hairs

Racemes 6-12, narrow, 2.5-15 cm. long, lax-flowered; rhachis firm, flexuous, compressed; pedicels of spikelets flattened, slightly dilated at the apex, densely silky-villous on the edges. Spikelets 4 mm. long (excluding the long awn). Glumes 4; lower involucre glume linear-oblong, crustaceous below, membranous above with a hyaline tip, silky-villous on the back, the margins narrowly incurved, villous with long silky hairs; upper involucre glume oblong, 1-nerved, tip erose, margins incurved, ciliate, lower floral glume 3 mm. long, narrowly oblong, hyaline, flat, nerveless, upper floral glume shorter than the upper involucre glume, linear-oblong, cleft into 2 subulate lobes, palea 0, awn reaching 2 cm. long, not or scarcely ciliate, the lower half brown, twisted, the upper half white, straight.

Locality : *Khandesh* Tapti Valley, railway line (Bhide !)

Konkan Bombay, St. Xavier's College compound (McCann 4510 !), Marine Lines (Hallberg 9889 !); Bassein (McCann 9475 !), Vetora (Sabnis 33507 !); Parsik Hill (McCann 9715 !), Kanari Caves (McCann 9723 !), Ghatkopar, Horse-shoe Valley (McCann 9891 !); Ratnagiri (Woodrow), near Ratnagiri (Herb. Econ. Bot. Poona !).

W. Ghats : Khandala, very common (McCann 9716 !), Lonavla (Bhide !, McCann !, Woodrow, Lusboa); Panchgani (Blatter 5388 !, Blatter & Hallberg B1213 !, McCann !); Castle Rock (Bhide !, McCann A304 !).

Deccan : Lohagad, way up (McCann 9718 !); Mawal (Woodrow).

S. M. Country : Dharwar Dist. (Sedgwick 2112 !); Dastikop (Sedgwick 2088 !).

N. Kanara : Supa Taluka (Talbot 2257 !); Jugglepet (Talbot 1569 !); Yellapur (Talbot 1525 !), Halyal (Talbot 2224 !), Kumberwada (Talbot 2257 !), Dandeli (Talbot 2267 !).

Ecology : A subregregarious species. Often found on newly laid down pasture ground. Very abundant in high grasslands in the Mallad tract of the Carnatic.

Distribution : Throughout India, Ceylon, Malaya, Australia.

Economic uses : When young it is eaten by cattle. In Poona it is used for thatching and brooms.

Explanation of Plate 35 : *Eulalia argentea* Bogn.

- | | |
|------------------------|---------------------|
| 1. Lower invol. glume. | } Sessile spikelet. |
| 2. Upper invol. glume. | |
| 3. Lower floral glume. | |
| 4. Upper floral glume | |
| 5. Grain with styles. | |

2. EULALIA FIMBRIATA Blatter & McCann.

PLATE 36.

Eulalia fimbriata Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 290.

Pollinia fimbriata Hack. Monogr. Androp. (1889) 164, Hook. f. Fl. Brit. Ind. VII (1896) 112;

Cooke Fl. Bomb. II (1908) 950.

Description : Annual; stem 30-60 cm. long; internodes much longer than the sheaths; nodes glabrous. Leaves 15-25 cm. by 4 mm., flaccid, sparsely hairy above; sheaths glabrous; ligule a ciliate ridge.

Racemes 2-6, villous with white hairs, 2.5-7.5 cm. long, flexuous, pale, with long peduncles; rhachis slender, silky-hairy; pedicels of spikelets with 2 opposite rows of dense silky hairs. Spikelets 3 mm. long; callus very short, silky-villous with long white hairs. Glumes 4; lower involucre glume elliptic-lanceolate, with villous keels above, 2-toothed; upper involucre glume as long as the lower, elliptic, obtuse, with incurved ciliate margins; lower floral glume 3

mm. long, narrowly oblong, obtuse, hyaline, ciliate; upper floral glume 2.5 mm. long, hyaline, deeply 2-fid into 2 acute lobes; awn 13-19 mm. long, ciliate, the lower half brown, twisted, the upper half white; palea minute or 0.

Locality: *Konkan*: Dahe Forest (Ryan 708 !); Uran (McCann 5123 !); Trombay (McCann 305 !); Borivli to Kanari Caves (McCann 1092 !).

W. Ghats: Matheran, Monkey Point (D'Almeida A254 ! A255 !); Khandala, common (McCann 5300 !); Lonavla (Chubber 11 !, Woodrow 173).

Ecology: A smaller species than the last. It grows in open grassland occasionally in tufts by itself. When in open grassland it is frequently associated with species of *Dimera*, *Ischaemum* and *Themeda*. Flowers towards the end of August.

Distribution: W. Himalaya, W. Peninsula, Pegu.

Explanation of Plate 36: *Eulalia fimbriata* Blatter & McCann.

- | | |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | } Sessile spikelet. |
| 5. Upper floral glume. | |
| 6. Stamens and styles. | |
| 7. Ligule. | |

26. *Sorghum* Pers.

Annual or perennial, often robust, grasses. Leaf-blades convolute in bud, usually flat, herbaceous, often large.

Panicles erect or nodding with verticillate or scattered branches, often large, in the spontaneous species mostly loose, in the cultivated forms frequently variously contracted to compact. Spikelets 2-nate, those of each pair differing in shape and sex, one sessile, the other pedicelled or represented by a pedicel only, on the articulate fragile or (in cultivated forms) tough rachis of panicle few- (sometimes 1- or, the other extreme, 6-8-) jointed racemes, the sessile spikelet falling with the contiguous joint and the accompanying pedicelled spikelet or at least its pedicel. Florets 2, lower reduced to an empty valve, upper hermaphrodite in the sessile, male or neuter in the pedicelled spikelets, if present at all. Sessile spikelet: involucre glumes equal, coriaceous, at least when mature, rarely permanently chartaceous, mucous. Lower with a broad flattened or convex back with the margins narrowly inflexed near the tips and elsewhere involute. Upper cymbiform with narrow hyaline, usually upwards ciliate margins. Lower floral glume empty, hyaline, ciliate, 2-nerved or nerveless. Upper oblong to ovate, 1-3-nerved, 2-lobed or dentate, with the lobes free or more or less adnate to a perfect or variously reduced awn or a mucro rising from the sinus, rarely entire and mucronate or mucous. Palea hyaline, often minute or 0. Lodicules 2, ciliate or glabrous. Stamens 3. Stigmas laterally exerted; styles terminal or subterminal. Grain in the wild species mostly obovoid, dorsally compressed, in cultivated forms frequently enlarged, globose or subglobose; embryo as long or slightly longer than half the grain. Pedicelled spikelets, if present, much narrower than the sessile, lanceolate to subulate, male or neuter, sometimes reduced to the glumes or one glume only or quite suppressed. Involucral glumes permanently herbaceous, awnless like the hyaline 2-1-nerved ciliate floral glumes.

According to Stapf (Fl. Trop. Afr. IX, 105) there are about 35 wild species in the tropical and subtropical regions of both hemispheres, very few extending into the temperate zones. One group of forms is widely cultivated in the tropics, particularly in Africa.

The classification of the material belonging to the section *Eu-sorghum* forms a difficult problem, which we are not prepared to tackle at present. The difficulties are well explained by Stapf (l. c.), and we cannot refrain from quoting the passage, though somewhat lengthy, because it may be a help to workers on this genus and induce them, at the same time, to subject the vast material available in the Presidency to a more scientific examination and exact taxonomic treatment, by which Botany as well as Agriculture will profit.

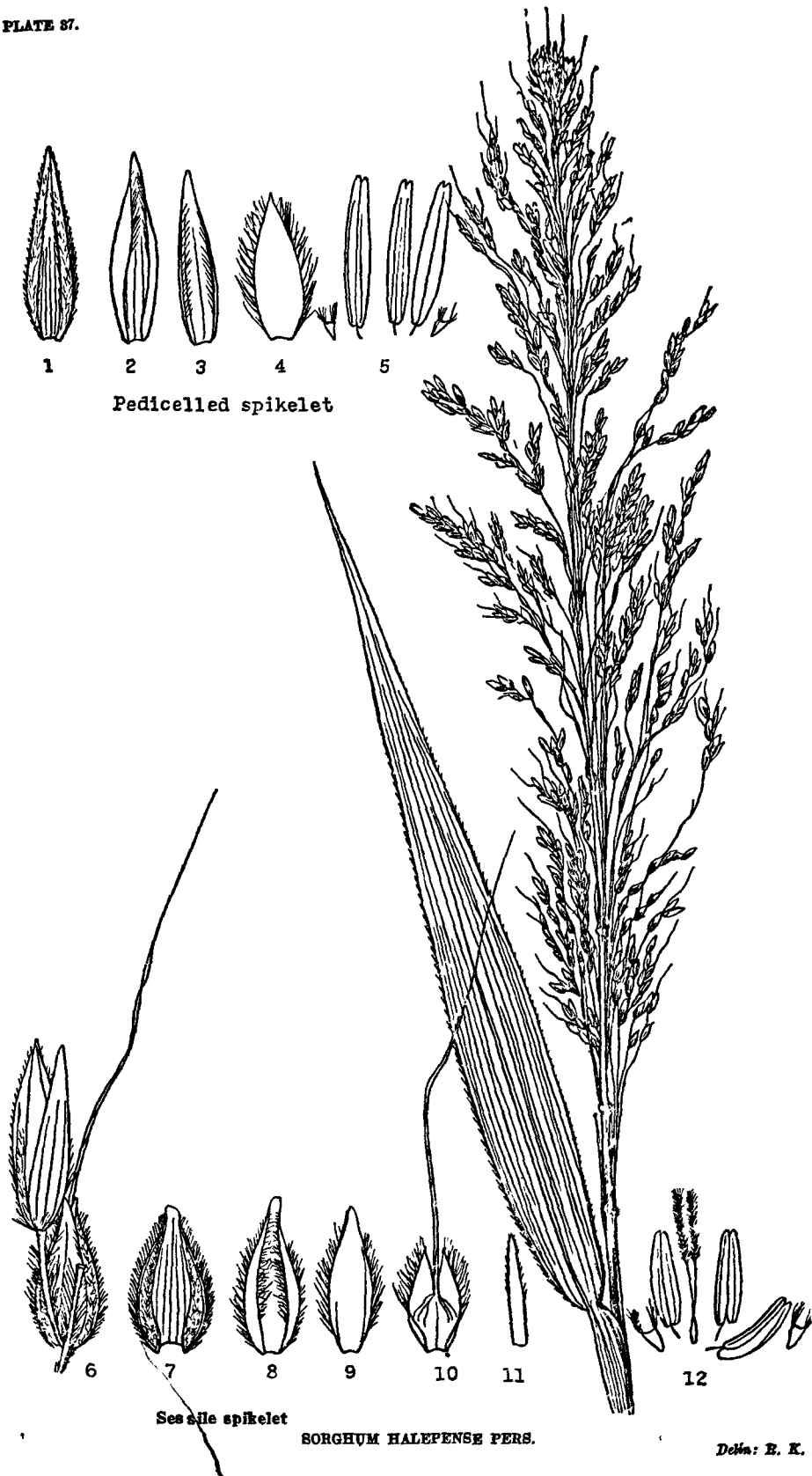
Those species, says Stapf, "which come under consideration in this work (Flora of Tropical Africa) have, with two exceptions (*S. purpureo-sericeum* and *S. versicolor*), been placed by Hackel in one vast species, *Andropogon Sorghum*, the leading idea being that they were all derived from one wild ancestor, the old *Holcus halepensis* Linn. Piper, however, has recently advanced good reasons why this is extremely improbable. He has pointed out that the Linnean *Holcus halepensis* (*Andropogon Sorghum*, subsp. *halepensis*, var. *geminus* Hack.) is a perennial type almost confined to the Mediterranean region (*sensu lato*) and absent from tropical Africa which is the home of most of the spontaneous annual forms and probably also the cradle of most of the cultivated races known collectively as Guinea corn (*Andropogon Sorghum*, subsp.



Sessile spikelet

EULALIA FIMBRIATA BLATTER & McCANN

Detm: R. K. Bhude.



SORGHUM HALEPENSE PERS.

Detin: B. K.

sativus, Hack.). To these spontaneous annuals and the cultivated forms he confines the name *Andropogon Sorghum*, and dealing in particular with the former he groups them under 11 sub-species, whilst he abstains from attempting to classify the latter. Most of Piper's subspecies are here recognised as definite units, but with the status of species, a procedure which seems to have the advantage of simplicity and directness, whilst it leaves the door open to any theoretical grouping which may in the future be desirable. The same reasoning has been applied to the cultivated forms. Hence the breaking up of Hackel's *Andropogon Sorghum*, var. *sativus*. Koernicke, who made the first comprehensive attempt to classify them, relied for that purpose exclusively on characters exhibited by mature infructescences, especially their degree of looseness or contraction and the colours of the ripe glumes and grains; but Hackel in his monograph introduced characters taken from the shape of the spikelets. The grain being in most cases the thing aimed at in the evolution of these very numerous races, it is clear that artificially introduced modifications must from the beginning have tended, in the grain-state, to obscure or repress the phylogenetically important features in so far as they were economically indifferent or undesirable. It seemed, therefore, more promising to base the primary grouping on the comparison of the flowering stages, which might be expected to be more or less outside the influence of the artificially moulding forces of man. Within these primary groups, which are treated here as species, nothing more than a purely artificial arrangement can for the present be attempted. An exhaustive treatment of the hundreds of races which have been given distinctive popular names would, even if it were possible, be beyond the scope of a colonial flora".

If Stapf, with all the facilities of Kew and the British Museum and other European herbaria at his disposal, complains about "the very rudimentary state of our knowledge and of our collections," nobody can reasonably expect that we should bring order into the chaotic states of the *Sorghum*-question in India. Years of intensive study of Indian and African forms are required to bring the intricate problem nearer its solution.

For the present we follow Haines in retaining the old species of *S. halepense* and *S. vulgare*. Of species not known from the Presidency before we add *S. subglabrescens* Schweinf. and Aschers. and *S. nitidum* Pers. This, we admit, is not quite satisfactory, but it is all we can offer at the present state of our knowledge and with the material at our disposal in India.

In order to enable Indian Botanists to utilise Stapf's and Piper's investigations in the further study of the genus *Sorghum* we shall add, in the way of an appendix, the descriptions of those species which Stapf has described from tropical Africa and which have also been observed in India, whether in the Presidency or outside it. It is only in this way that we shall be able to coordinate the knowledge obtained on the so widely spread a genus like *Sorghum* and it would not help botanical science to split the investigation of Indian Sorghums on independent lines without constant reference to the work done in other fields. It might be easier and perhaps also more convenient for certain practical purposes, but on the whole certainly less scientific and in the long run more confusing.

A. Wild species.

I. Racemes up to 4-noded.

1. Primary branches of panicle divided.

- | | |
|---|----------------------------------|
| a. Stems up to 4.5 m. high . . . | 1. <i>S. halepense</i> . |
| b. Stem about 75 cm. high . . . | 2. <i>S. subglabrescens</i> . |
| 2. Primary branches of panicle simple . . . | 3. <i>S. purpureo-sericeum</i> . |

II. Racemes 2-3-noded . . .

- | |
|------------------------|
| 4. <i>S. nitidum</i> . |
|------------------------|

B. Cultivated species . . . 5. *S. vulgare*.

1. *SORGHUM HALEPENSE* Pers.

PLATE 37.

Sorghum halepense Pers. Syn. I (1805) 101, Reichb. Ic. Fl. Germ. t. 54, Duthie Grasses N. W. Ind. (1883) 23, Fedder Grasses N. Ind. (1888) 40, t. 27.

Andropogon halepensis Brot. Fl. Lus. I (1804) 89; Sibth. Fl. Graec. I, t. 63, Kunth Enum. Pl. I (1838) 502, Suppl. 412, t. 40, fig. 1; Lusboa Bomb. Grasses (1896) 74, Hook. f. Fl. Brit. Ind. VII (1896) 182; Cooke Fl. Bomb. II (1908) 983; Haines Bot. Bib. and Or. (1924) 1033.

A. laxus Roxb. Fl. Ind. I (1832) 271 (non Willd.).

A. milaceus Roxb. l. c. 272; Hack. Monogr. Androp. (1889) 541.

A. Sorghum subsp. *halepense* Hack. l. c. 501.

Holcus halepensis Linn. Sp. Pl. (1753) 1047; Schreb. Besch. Graes. I.

H. decolorans Willd. Sp. Pl. IV, 931.

Vernacular names : Boru, Baru, Kartal, Dacle, Batal.

Etymology : *Sorghum* after *sorgo* or *sorgho*, an African name of the grass.—*Halepense* from Aleppo, a town in Syria, where the grass was found.

Description : Perennial, stems erect, tall, up to 4.5 m. high, stout, simple or sparingly branched, glabrous, leafy; nodes minutely silky. Leaves 30-60 by 2.5 cm., linear-lanceolate, tapering to a fine point, glabrous, smooth, margins scabridly serrulate, midrib stout, base narrowed or sometimes rounded; sheaths glabrous, strate, ligule short, membranous, ciliate.

Panicle 15-45 cm. long, decompound, rhachis nearly smooth; branches mostly alternate, suberect, filiform, the lower branches up to 20 cm. long or more, the axils often bearded; racemes 13-25 mm. long, oblong, joints 3-7, more than half as long as the sessile spikelets, more or less ciliate; pedicels similar. Sessile spikelets 4-5 mm. long, ovoid-lanceolate, dorsally compressed, green or purplish, callus small, shortly bearded. Glumes 4, lower involucral glume subchartaceous, ovate, acute, convex, more or less silky-hairy, 5-13-nerved, with involute margins, upper involucral glume as long as the lower, lanceolate, acuminate, chartaceous, shining, 5-7-nerved; lower floral glume almost as long as the upper involucral glume, elliptic-oblong, obtuse, hyaline, ciliate, upper floral glume 2 mm. long, oblong, 2-lobed, hyaline, ciliate; awn 13 mm. long, sometimes reduced to a bristle or suppressed. Pedicellate spikelets about as long as the sessile but much narrower, not awned, male or barren; lower involucral glume herbaceous, 5-9-nerved, glabrous, the keels ciliate; upper involucral glume similar, 3-5-nerved; lower floral glume as in the sessile spikelets; upper floral glume linear-oblong, hyaline.

Locality : *Gujarat* Ahmedabad (Gammie 16389 !), Perim Isl., Gulf of Cambay (Blatter 3813 !).

Khandesh · Toranmal (McCann 9843 !), Khadgaum (McCann 9642 !).

Konkan Bassein Fort (Chibber 138 !); Kase Forest, Dhann Range (Ryan 1919 !), Vetora (Sabnis 33072 !), Trombay (McCann A269 !); Byculla (McCann 9656 !).

W. Ghats : Khandala, railway line, near Rama's Bed (McCann 9426 !); Pan-chgani (Blatter & Hallberg B1302 !).

Deccan · Ganeshkhind Botanic Gardens (Herb. Econ. Bot. Poona !), Furandhar (McCann 5001 !).

S. M. Country : Kunnur, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4984 !); near Kilgerri (Talbot 2617 !).

N. Kanara : Halyal Fort (Talbot 2006 !).

Ecology : A gregarious grass. Common in cultivated and uncultivated soil, grows in hedges and banks of watercourses.

Distribution : Most warm countries.

Economic uses : A good fodder grass. The grain is eaten. See Vinalle, H. N., A study of the literature concerning poisoning of cattle by prussic acid in *Sorghum*, Sudan grass and Johnson grass, Journ. Amer. Soc. Agron. 13 (1921) 267-80. Gives remedies for hydrocyanic acid poisoning.

Explanation of Plate 37 : *Sorghum halepense* Pers.

- | | |
|--------------------------------------|------------------------|
| 1. Lower invol. glume. | } Pedicelled spikelet. |
| 2. Upper invol. glume. | |
| 3. Lower floral glume. | |
| 4. Upper floral glume. | |
| 5. Stamens and lodicules. | |
| 6. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 7. Lower invol. glume. | |
| 8. Upper invol. glume. | |
| 9. Lower floral glume. | |
| 10. Upper floral glume. | |
| 11. Palea of upper floral glume. | |
| 12. Stamens, styles and lodicules. | |

2. *SORGHUM SUBGLABRESCENS* Schweinf. & Aschers.

Sorghum subglabrescens Schweinf. & Aschers. in Beitz, Fl. Aethiop. (1867) 302, 306; Stapf in Fl. Trop. Afr. IX (1917) 137.

Andropogon subglabrescens Steud. Syn. Pl. Glum. I (1855) 393.

A. Sorghum subsp. sativus, var. *subglabrescens* Hack. Monogr. Androp. (1889) 519; Chiovenda in Ann. Istit. Bot. Roma, VII, 25.

Description : Annual. Culms (Stapf saw only a meagre specimen) slender, almost simple, 75 cm. high, about 8-noded, internodes, except the uppermost shorter than the sheaths. Leaf-



SORGHUM PURPUREO-SERICEUM ASCHERS. & SCHWEINF

Delin. B. K 1

sheaths finely pubescent at the nodes; ligules very short, shortly ciliate from the back; blades linear from a broad (middle and upper leaves) or slightly narrowed (lower leaves) base, long-attenuated upwards, up to 20 by 1.7 cm., green, flushed with red, quite glabrous.

Panicle oblong, erect, 8.5 by almost 2.5 cm., contracted, moderately dense; branches scattered, erect, the longest not much over 2.5 cm. long and undivided for about 12 mm. from the base, almost simple, scabrid to spinulously ciliate, sparingly hairy at the base. Racemes tough, up to 4-noded and 8.5-11 mm. long, dense, joints rather stout, up to 2 mm. long, shortly whitish ciliate; pedicels very similar, up to 1 mm. long. Sessile spikelet oblong, acute in flower, broad-ovoid or ellipsoid in fruit, 6.3 by 3.3 mm., at length variegated, awned; callus-beard scanty, 1 mm. long. Involucral glumes equal, gaping when mature, more or less coriaceous and glossy in the lower third, spongy-subcoriaceous and constricted about the middle, then papery, more or less whitish-strigillose, at length sometimes almost glabrous, lower finely 13-nerved; nerves showing above the coriaceous base, keels rather sharp, scabrid, running into minute-teeth, between which the minute hyaline tip protrudes, the coriaceous part rich maroon to almost black, followed by a pale transverse zone, then violet or purple across the middle, the broad triangular somewhat depressed tip straw-colour or reddish upwards; upper glume almost as broad as the lower, 9-nerved, slightly keeled, coloured like the lower. Floral glumes ciliate; lower broad-oblong, up to almost 5.3 mm. long; upper ovate, subtent, 3.3 mm. long, awn up to 12 mm. long, sharply bent, column stout, twisted, equalling the bristle. Grain exposed upwards between the gaping glumes, equalling or slightly exceeding them, obovoid, 4.2 mm. long, more or less orange, embryo-mark and nerves obscure. Pedicelled spikelet neuter, persistent, linear-lanceolate, acute, 5.3 mm. long and more, reddish, lower involucral glume up to 11-, upper 7-nerved.

According to Stapf the specimen from India is a smaller variety of the type just described.

Locality: Mahratta Country (Young ex Stapf).

Distribution. Abyssinia, tropical Arabia.

3. *Sorghum purpureo-sericeum* Aschers. & Schweinf.

PLATE 38

Sorghum purpureo-sericeum Aschers. & Schweinf. in Schweinf. Beitr. Fl. Aethiop. (1867) 302, 306; Stapf in Fl. Trop. Afr. IX (1917) 140.

Andropogon purpureo-sericeus Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 469; Hack. Monogr. Androp. (1889) 524, Hook. f. Fl. Brit. Ind. VII (1896) 185, Cooke Fl. Bomb. II (1908) 984.

Etymology: *Purpureo-sericeum* means purple-silky.

Description: Annual, robust; stem 90-120 cm. high, erect, stout or slender, smooth and polished, glabrous; nodes villous. Leaves 20-25 cm. by 6-8 mm., linear, finely acuminate, sparingly appressedly hairy on both sides, the margins scabrous; sheaths subcompressed, glabrous except the villous mouth; ligule very short, ciliate.

Panicle 10-20 cm. long, erect, rachis glabrous, branches filiform, subflexuous, 1.3-2.5 cm. long, often bulbously swollen at their articulation with the rachis; racemes 2.5-3.8 cm. long, rarely of 3 joints, sometimes of 1 sessile and 2 pedicellate spikelets; joints about half as long as the sessile spikelets. Sessile spikelets reaching 6 mm. long, densely villous with red or white hairs; callus small, densely villous. Glumes 4, lower involucral glume ovate, acuminate, concave, coriaceous or cartilaginous, 7-nerved, with the margins involute from the base to the tip, clothed with long red or white hairs, upper involucral glume as long as or rather longer than the lower, oblong-lanceolate, coriaceous, concave, acuminate or aristulate, 5-nerved, the back clothed in the upper part with long hairs, the margins narrowly infolded; lower floral glume as long, membranous, densely ciliate, oblong-lanceolate, glabrous on the back, upper floral glume very fragile, 2.5 mm. long, hyaline, 2-lobed, ciliate, awn reaching 3.8 cm. long, the column dark brown, twisted, and ciliate with short erect hairs. Pedicellate spikelets equalling the sessile but paler and narrower; lower involucral glume linear-lanceolate, acute, 5-9-nerved, shortly silky; upper involucral and lower floral glumes as in the sessile spikelets, upper floral glume a little shorter, lanceolate, acuminate, hyaline, ciliate.

Locality: Gujarat Garvi Dangs, in a field (Herb. Econ. Bot. Poona I)

Khandesh (Herb. Econ. Bot. Poona I); Bhusawal (McCann 5224 I).

Deccan: Poona, above the Ghats (teste W. Burns).

S. M. Country: Kolhapur (Woodrow I); Belgaum (Ritchie 887).

N. Kanara (Woodrow 40 I).

Distribution: Central Provinces, W. Peninsula, tropical Africa.

Explanation of Plate 38 : *Sorghum purpureo-sericeum* Aschers. & Schweinf.

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|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume and lodicules. | |
| 6. Stamens, ovary, and styles. | |

4. SORGHUM NITIDUM Pers.

Sorghum nitidum Pers. Synop. I (1805) 101 ; Haines Bot. Bib. and Or. (1924) 1034.

Andropogon nitidus Kunth Revis. Gram. I (1829) 166.

A. serratus Thunb. Fl. Jap. (1784) 41 ; Hack. Monogr. Androp. (1889) 520.

Anatherum nitidum Spreng. Syst. I (1825) 290.

Andropogon fuscus J. S. Presl. in C. B. Presl. Reliq. Haenk. I (1830) 342.

A. consimilis Steud. Syn. Pl. Glum. (1855) 394.

A. pedicellatus Steud. l. c. 394.

Holcus fulvus R. Br. Prodr. (1810) 199

Sorghum fulvum Beauv. ap. Roem. et Schult. Syst. II, 840.

Chrysopogon fuscus Trin. in Steud. Nomencl. ed. 2 (1840) 360.

Etymology : *Nitidum* means shining.

Description : A tall tufted grass, 1-2 4 m. high, densely villous at the nodes. Leaves 10-75 cm. by 8-20 mm. setaceously acuminate, glabrous or sparsely hairy on both surfaces, hairs often tubercle-based, midrib broad, prominent, white, sheaths terete below, keeled upward, more or less hairy, mouth silky-villous ; ligule very short, truncate

Panicle 10-30 cm. long, oblong, lax, subsimple, rhachis glabrous, branches capillary, about equalling the spikes, glabrous or scaberulous, whorls distant. Spikes 8-37 mm. long, red-brown, joints and pedicles $\frac{1}{2}$ to $\frac{3}{4}$ the length of the sessile spikelets, margins shortly villous. Sessile spikelets broadly ellipsoid, callus rounded (Haines), or acute (Hook. f.). Lower involucre glume coriaceous, broadly oblong or elliptic acute or obtuse, dorsally flattened with incurved margins, brown-hairy and keels hispid, 7-nerved, or about 3-nerved between keels, sometimes nearly black, polished. Upper involucre glume broadly cymbiform with rounded back, lanceolate, acute, 1-nerved, hairy upwards. Lower floral glume as long as or shorter than the upper involucre glume, hyaline, margins inrolled, 2-keeled, ciliate ; upper floral glume linear-oblong, 2-lobed, awned or not. Pedicellate spikelet linear-oblong, pale or greenish with brown hairs. Lower involucre glume oblong, rounded or subtruncate, dorsally depressed and 2-nerved between the keels, upper equal, rather narrower, obtuse margins much inflexed, 3-nerved between the keels. Lower floral glume hyaline, linear.

Locality : N. Kanara : Tinai (Talbot 2574 !) ; Sambiam (Talbot 1337 !) ; Sirai to Siddhapur (Hallberg and McCann A270 !).

Distribution : India, Ceylon, Nicobars, Ama, tropical Australia.

***5. SORGHUM VULGARE Pers.**

Sorghum vulgare Pers. Syn. I (1805) 101 ; Watt Dict. Econ. Prod. VI, pt. 3, 289, Haines Bot. Bib. and Or. (1924) 1033.

Andropogon Sorghum Brot. Fl. Lusit. I (1804) 88, Lisboa Bomb. Grasses (1896) 75, Hook. f. Fl. Brit. Ind. VII (1896) 183, Cooke Fl. Bomb. II (1908) 991.

Holcus Sorghum Linn. Sp. Pl. (1753) 1047, Grah. Cat. Bomb. Pl. (1839) 238, Dalz. & Gibs. Bomb. Fl. (1861) 99.

Vernacular names : The Great Millet, Jondla, Jowar, Juari.

Description : Stout, usually tall annual grasses. Leaves broadly linear with a prominent white midrib.

Panicle usually thyriform decompound with crowded whorls of erect branches and branchlets, rarely subeffuse. Rhachis of spike tenaceous, joints when forcibly separated leaving a ragged scar at the tip. Pedicelled spikelets usually neuter, pedicels short.

This is the Great Millet cultivated in most parts of the Presidency. (See H. H. Mann, Fodder Crops of W. India Dept. Agr. Bombay, Bull. 77 of 1916, and G. L. Kottur, Classification and Description of the Jowars of the Bombay Karnatik. Dept. Agr. Bombay, Bull. 92 and others.)

After what we have said above, we do not consider it advisable to enter into a description of the numerous varieties and forms. But we may mention in this place that a variety common

in the Presidency viz., *S. vulgare* var. *Roxburghii* Hackel in Monogr. Androp. 510 has been described as a separate species by Stapf under the name of *S. Roxburghii* in Fl. Trop. Afr. IX, 126. So the description will be given in the following appendix to the genus *Sorghum*.

APPENDIX

Containing species of *Sorghum* described from Africa by Stapf which occur also in India.¹

- A. Mature sessile spikelets deciduous with the adjoining joint of the rachis and its pedicelled companion: spontaneous grasses 1. *S. verticilliflorum*.
- B. Mature sessile spikelets persistent. cultivated grasses.
- I. Mature glumes wholly coriaceous or the lower with a herbaceous triangular tip, its nerves not visible on the back except at the tip, particularly when this is herbaceous
1. Mature panicles more or less loose, usually with arched or drooping branches, never quite compact
- a Sessile spikelets ovate or elliptic- to lanceolate-oblong.
- * Mature spikelets pale straw-colour, permanently more or less hairy, the grain embraced below by the tightly appressed glumes 2. *S. Roxburghii* var. *sema-clausum*.
- ** Mature spikelets bright tawny, early glabrescent, the grain almost wholly exposed between the involute glumes 2. *S. Roxburghii* var. *hans*.
- b. Sessile spikelets broadly obovate in outline 3. *S. bicolor* var. *obovatum*.
2. Mature panicles very dense to compact, rarely more or less loosened owing to the reduction of the primary axis and the consequent subdigitate arrangement of the branches 4. *S. Durra*.
- II. Mature glumes thinly crustaceous to papery, the tips brittle and breaking irregularly. Back of spikelets longitudinally striate
1. Sessile spikelets 6.3-8.5 mm. long. Pedicelled spikelets 7.6-10 mm long 5. *S. papyrascens*.
2. Sessile spikelets 5.6-3 mm. long. Pedicelled spikelets up to 6.3 mm. long 6. *S. cernuum*.

1. *SORGHUM VERTICILLIFLORUM* Stapf.

Sorghum verticilliflorum Stapf in Fl. Trop. Afr. IX (1917) 116.

S. halepense Nees Fl. Afr. Austr. (1841) 88 (non Pers.).

Andropogon verticilliflorus Steud. Syn. Pl. Glum. I (1855) 393.

A. Sorghum, subsp. *halepensis*, var. *effusus* Hack. Monogr. Androp. (1889) 503 (partim).

A. Sorghum verticilliflorus Piper in Proc. Biol. Soc. Wash. XXVIII, 37.

A. halepensis var. *effusus* Stapf in Dyer Fl. Cap. VII, 346 (partim)

Etymology: *Verticilliflorum* alluding to the whorled branches of the panicles.

Description: An annual. Culms 1.2-2.4 m. high, sometimes slightly pruinose below the nodes. Leaf-sheaths delicately silky-pubescent at the nodes, ligules up to over 2 mm. long, scarious, hairy on the back; blades linear from a broad rounded and often clasping base, long-attenuated upwards, up to 45 cm. long, rarely over 25 mm. wide, green, sometimes slightly glaucous or flushed with purple, hairy just behind the ligule, otherwise glabrous.

Panicle oblong to ovoid-oblong, often rather contracted and more or less nodding at first, then spreading out and more erect, up to 37 cm. long and ultimately 15-22 cm. wide; branches slender, flexuous, whorled, longest up to 22 cm. long and undivided to up to 5, rarely 7.5 cm. from

¹ All the information is taken from Stapf, mostly almost verbatim.

the base, *distantly* branched, slightly and shortly hairy to villous at the base, like the branchlets more or less rough, at least upwards. Racemes fragile, up to 5-, but mostly 2- or 3-noded, rarely over 18 mm. long, joints slender, 3.3-4.2 mm. long, shortly ciliate, cilia dirty white or pale fulvous, often with a tinge of purple; pedicels similar, slightly shorter, their tips subdisoid. Sessile spikelet ovate to ovate-lanceolate, shortly acuminate to acute, 5.3-6.3 mm. by 2.3 mm., straw-coloured, greenish towards the tips (at least when young), sometimes tinged with purple, ultimately often turning bright or blackish-red, particularly below; callus-beard less than 1 mm. long. Involucral glumes equal, coriaceous, slightly glossy below (more so when ripening) thinner upwards, lower usually slightly bulging below and somewhat depressed towards the tips, 11-13-nerved, with the nerves very obscure near the tips or more or less marked, sharply 2-keeled and scabrid to spinulously ciliate in the upper half or third, more or less strigillose, often glabrescent, rarely almost glabrous, hairs pale whitish or fulvous, loosely appressed, upper sharply keeled towards the tips with the keel rough, 7-nerved, more or less hairy. Floral glumes conspicuously ciliate, lower lanceolate, 5.3 mm. long, upper ovate, shortly 2-lobed, 3.2 mm. long, awn fine, 1.3-1.7 cm. long. Anthers 3.3 mm. long. Grain obovate-oblong, 3.3 mm. by 0.2 mm., fuscous, paler below, embryo-mark distinct, hardly exceeding the middle of the grain. Pedicelled spikelet male or neuter, early deciduous, subulate-lanceolate to linear, acutely acuminate, 6.3 mm. long, pale greenish often tinged with red or purple; lower involucral glume 9-, upper 5-nerved.

Distribution : Nileland, Mozambique District, Natal, the Comoros, Seychelles, Madagascar, the Mascarenes. Introduced into India as Tabucki grass, also to Australia, Polynesia, and the West Indies

2. *Sorghum Roxburghii* Stapf.

Sorghum Roxburghii Stapf in Fl. Trop. Afr. IX (1917) 126.

Description : Annual. Culms stout, tall, often slightly waxy, pruinose below the nodes. Leaf-sheaths softly pubescent at the nodes, ligules very short, scarious, hairy from the back; blades linear to linear-lanceolate from a broad clasping base, long-attenuated upwards, up to over 45 cm. long and up to 37 mm. wide, usually hairy to tomentose inside above the ligule and outside at the junction with the sheath, otherwise glabrous.

Panicle oblong to ovoid-oblong, rarely subobovate or elliptic in outline, erect, contracted and dense (rarely lax) in flower, somewhat to much loosened when mature; branches slender, flexuous, whorled or semiverticillate, the longest undivided for up to 12-25 mm. (rarely much more) from the base, more or less ciliate towards the base and often villous at the junction with the nodes, otherwise like their divisions glabrous or nearly so, finely scabrid upwards. Racemes tough, up to 4- (rarely 5-) noded, 8-12 mm. long; joints slender, 2.3-3 mm. long, distinctly and often densely ciliate, cilia white or purplish, pedicels similar but more slender, of about the same length or more often shorter with very slightly thickened tips. Sessile spikelet ovate, acute, with a small fine point, sometimes flattened on the back when young but soon convex, about 5.3 mm. by 2.7-3.3 mm. permanently pale or dull straw-coloured to tawny, at length slightly glossy; callus-beard white. Involucral glumes equal, coriaceous, lower about 10-13-nerved, finely and often obscurely 2-keeled towards the tips with the keels slightly scabrid, transversely constricted at the base, more or less white-strigillose (to almost tomentose) when young at length more or less glabrescent on the back, upper 7-9-nerved, finely keeled upwards, tip usually straight. Floral glumes distinctly ciliate, cilia up to 1 mm. long, lower broad-oblong, as long as the glumes, upper broad-ovate, 3.3-4 mm. long, middle nerve much thickened from the middle upwards, running out into a short straight mucro, lobes adnate to it almost all along. Anthers 2.7 mm. long. Grains elliptic or ovate-elliptic in outline, 3.8-4.8 mm. by 2.7-3.3 mm., dull white (in the African specimens). Pedicelled spikelet usually neuter, linear or linear-lanceolate, up to 4.2 mm. long, more often much reduced and quite small, persistent; lower involucral glume, if well developed, up to 9-nerved upper 5-nerved.

Of this species Stapf describes two varieties which also occur in India.

VAR. *SEMICLAUSUM* Stapf.

Var. *semiclausum* Stapf in Fl. Trop. Afr. IX (1917) 127.

Holcus Sorghum minus et *Sisna* Wall. Cat. 8777 F. A.

Andropogon Sorghum, subsp. *sativus*, var. *Roxburghii* (?) and *fulvus* Hack. Monogr. Androp. (1889) 510 and 512.

A. Sorghum var. *Usorum* (?) Stapf in Dyer Fl. Cap. VII, 348, *in nota*; Medley Wood, Natal Fl. II (1907) t. 120, (*non* Koern. *neque* Hack.).

Etymology : *Semiclausum* alludes to the fact that the involucral glumes clasp the grain so that only its top or upper half is visible.

Description : Panicles fairly dense, also when mature. Involucral glumes less coriaceous towards the tips and more or less showing the nerves in that portion, permanently more or less strigillose, their margins clasping the grain so that only its top or upper half is exposed.

Distribution : Nileland of tropical Africa, Mozambique District, Natal, Madagascar, India.

VAR. *HIANS* Stapf.

Var. hians Stapf l. c. 127.

Holcus Sorghum nitidum Wall. Cat. 8777D.

Andropogon Sorghum var. hians Stapf in Hook f. Fl. Brit. Ind VII (1896) 184.

A. Sorghum var. Rozburghii K. Schum. in Engl. Pfl. Ost.-Afr. B, 48; C. t. IV, F-H; Busse & Pilger in Engl. Jahrb. XXXII, 184 (*partim*).

Etymology : *Hians* means gaping, referring to the margins of the involucral glumes being involute, thus exposing the whole grain.

Description : Panicles more or less loose with very flexuous and often drooping branches. Involucral glumes coriaceous to the tips with the nerves quite obscure, subglabrous and somewhat glossy on the back when mature, their margins involute, exposing the whole grain, which is often placed with its back and front parallel to the median line of the spikelet.

Distribution : Mozambique District; also in India.

3. *SORGHUM BICOLOR* Moench VAR. *OBOVATUM* Stapf.

Sorghum bicolor Moench Meth. (1794) 207, *var. obovatum* Stapf in Fl. Trop. Afr. IX (1917) 127.

S. bicolor Willd. Enum. Hort. Berol. (1809) 1036.

S. nigrum Roem. & Schult. Syst. II, 837.

S. vulgare bicolor Pers. Syn. I (1805) 101.

S. vulgare, var. obovatum, subvar. nigrum Rendle in Cat. Afr. Pl. Welw. II, 151.

S. rubens Willd. Enum. Hort. Berol. (1805) 1036.

Holcus bicolor Linn. Mant. Alt. (1771) 301.

H. Sorghum Mieg in Act. Helv. VIII, 129, t. 4, fig. 4.

H. niger Ard. in Sagg. sc. e lett. acad. Padova, 1, 134, t. 5.

H. saccharatus Gaertn. Fruct. II (1788-91) 3, t. 80, fig. 2 (?), [*non aliorum auctorum*].

Andropogon niger Kunth Enum. I (1838) 501.

A. rubens Kunth l. c. 502.

A. Sorghum, subsp. sativus, var. obovatus Hack. Monogr. Androp. (1889) 514.

A. Sorghum var. bicolor Koern. in Bull. Herb. Boiss. II, 226.

Etymology : *Bicolor* means two-coloured.

Description : An annual. Culms stout, up to 4 m. high, many-noded. Leaf-sheaths mostly overlapping, finely pubescent at the nodes; ligules short, ciliate from the back; blades linear to lanceolate-linear from a broad and rounded or slightly narrowed base, up to 50 cm. long and 7.5 cm. broad, pubescent to tomentose inside above the ligules and less so or glabrous on the back at the junction with the sheath.

Panicles erect, contracted and more or less dense, or loose and oblong or oblong-ellipsoid or obovate to oblanceolate in outline 7.5-25 cm. by 5-9 cm.; branches erect or obliquely erect, rather rigid, finally sometimes slightly drooping, the longest often more than half the length of the panicle and undivided for 12 mm. to 75 cm. from the base, like the branchlets very rough, spinously ciliate or ciliate, particularly upwards, slightly hairy, rarely villous at the base. Racemes tough, compact, frequently 3- or 4- (rarely 5-) noded; joints somewhat stout, flattened, 1.6-2.7 mm. long, shortly whitish or fulvously ciliate; pedicels similar, about 1 mm. long. Sessile spikelet more or less broadly obovate even in flower with very short broad and depressed tips, 4.8-5.8 mm. by 3.3-4.2 mm., straw-coloured to tawny, finally darker, often with red or brown or purple spots or blotches or turning altogether fuscous, chestnut-brown or quite black, closed when mature or only slightly gaping, usually awned; callus-beard scanty. Involucral glumes equal, firmly coriaceous except at the papery to membranous tips, unevenly strigillose particularly and mostly persistently on the tips or almost glabrous; lower up to 16-nerved, nerves very faint, keels short, usually obscure, tips very short, broadly triangular with a hyaline point, depressed; upper broad, 9-nerved, obscurely keeled close to the tip, otherwise broadly rounded on the back. Floral glumes ciliate, lower broad-elliptic, about 4.2 mm. long, upper broad-ovate, 3.3 mm. long, 2-lobed, awn about 10.6 mm. long, sometimes much reduced. Anthers up to 4.2 mm. long. Grain tightly enclosed in the glumes or the top slightly exposed, obovate-oblong in outline, 3.3-3.8 mm. by 2.1-2.4 mm., brown; embryo-mark distinct; nerves obliterated. Pedicelled spikelet neuter,

persistent, lanceolate to linear-oblong, acute, about 4.2 mm. long, reddish; lower involucrel glume 9-10-, upper about 7-nerved.

Distribution: Lower Guinea. Occasionally cultivated in the Mediterranean region from Madeira to India, also introduced into Australia, the West Indies and Brazil.

4. *SORGHUM DURRA* Stapf.

Sorghum Durra Stapf in Fl. Trop. Afr. IX (1917) 129.

Holcus Durra Forsk. Fl. Aeg.-Arab. (1775) 174.

H. Duna (sphalm.) Gmelin Syst. 173.

Andropogon Sorghum var. *aegyptiacus* Koern. in Aschers. & Schweinf. III. Fl. Egypte (1887) 164.

A. Sorghum, subsp. *sativus*, var. *Durra* et *aegyptiacus* Hack Monogr. Androp. (1889) 516.

A. Sorghum, subsp. *sativus*, var. *Durra* Chiov. in Ann. Istit. Bot. Roma, VIII, 24.

A. Sorghum var. *niloticus* et *Schweinfurthianus* Koern in Aschers. & Schweinf. I c. 778, 779.

A. Sorghum var. *arabicus* et *rubrocernuus* Koern. in Bull. Herb. Boiss. II, App. II, 12 (probably).

Etymology: *Durra* is the name of the plant in Egypt.

Description: An annual. Culms stout, up to 4 m high and even more, 20-40-noded. Leaf-sheaths finely pubescent at the nodes, ligules very short, shortly ciliate; blades up to 40 cm. by 5 cm., quite glabrous (? always).

Panicle usually quite compact, ovoid or ellipsoid, erect or sometimes recurved, 10-15 cm. by 5-10 cm., branches erect, more or less flexuous, rather slender, rough to spinulously ciliate, particularly upwards, ciliate to subvillous at the base the longest up to one-half or one-third the length of the panicle, divided from very low down. Racemes compact, tough, about 8.5 mm. long (in flower), mostly 3- or 4-noded; joints somewhat stout, flattened, 1 to almost 2 mm. long, whitish-ciliate; pedicels annular, but still shorter. Sessile spikelet rhombic-obovoid, subacute (in flower), greenish or straw-coloured, with greenish tips, ultimately whitish or variously brown, dark red or black, awned or awnless, callus-beard scanty. Involucrel glumes equal, coriaceous up to beyond $\frac{1}{2}$ or $\frac{3}{4}$, then papery, unevenly strigillose, particularly at the tips and sides, lower with a broad triangular greenish strongly nerved tip, about 12-nerved with 3 or 4 finer nerves interspersed, 2-keeled upwards (keels rough), more or less flattened out and very broad to rotundate when mature with the tips worn off and the back glossy; upper broad, 9-nerved with some additional finer nerves, slightly keeled upwards. Floral glumes ciliate; lower ovate-elliptic, over 4.2 mm. long; upper broad-ovate, 2-toothed, 4.2 mm. long, awn up to 10.5 mm. long, mostly much shorter and then hardly twisted and differentiated into column and bristle or quite suppressed. Anthers over 2 mm. long. Grain subglobose, slightly compressed, with a broad rounded much exposed top, white, yellow or variously reddish, 5.3 by 5.3 mm., nerveless, embryo-mark faint. Pedicelled spikelet neuter (? always) persistent, lanceolate to linear-oblong, subacute, up to 6.3 mm. long, greenish or reddish, lower 11-, upper 7-nerved.

Distribution: Nileland of tropical Africa, Arabia, Afghanistan, India.

5. *SORGHUM PAPYRASCENS* Stapf.

Sorghum papyrascens Stapf in Fl. Trop. Afr. IX (1917) 131.

Etymology: *Papyrascens* means resembling paper.

Description: Only mature panicles were known to Stapf. Culms up to 17 mm. across at the base of the panicle

Panicle erect, oblong to oblanceolate in outline, contracted, dense, up to over 30 cm. by 10-13 cm.; branches more or less whorled, often many to a whorl, erect, the longer slightly arching, rather robust, like the branchlets rough to spinulously ciliate upwards and softly ciliate or pubescent in addition, villous at the base or 12 mm. above it, following (longest) up to 15 cm. long and undivided for 5-7 $\frac{1}{2}$ cm. from the base. Racemes tough, up to 4-noded and 18 mm. long, dense, much crowded; joints moderately slender, up to over 3.3 mm. long, shortly white-ciliate; pedicels annular 1.2-2.7 mm. long. Sessile spikelet oblong (in flower), at length ovoid or oblong-ovoid, tight or somewhat inflated, closed, up to 9.5 mm. long, permanently pale straw-coloured or reddish, callus-beard very short. Involucrel glumes equal, papery and transparent throughout; lower up to 16-nerved with numerous transverse veins, very obscurely keeled upwards or keel-less, nerves raised from the base upwards, softly pubescent to almost villous, very imperfectly glabrescent or at length almost glabrous, hairs white; upper broad, about 13-nerved, very obscurely keeled upwards, much less hairy. Floral glumes conspicuously ciliate; lower broad-elliptic, 5.3 mm. long; upper broad-ovate, entire and awnless or shortly 2-lobed, with a mucro or an awn up to 6.3 (rarely 10.6) mm. long, usually

slightly bent and hardly twisted. Lodicules densely ciliate. Grain completely enclosed by the glumes or partly exposed by their breaking up, obovate to orbicular-obovate in outline, compressed, biconvex, dull white or orange, embryo-mark faint, elliptic, slightly exceeding the middle of the grain. Pedicelled spikelet neuter, reduced to the involucreal glumes, persistent, linear or linear-lanceolate, acute, pale straw-coloured or reddish, 6.3-8.5 mm. long, lower 11-13-, upper 9-nerved, shorter.

Distribution : Nileland of tropical Africa. Also known from India.

6 SORGHUM CERNUUM Host.

Sorghum cernuum Host Gram. Austr IV, t 3, Reichb Ic. Fl Germ. (1845) t. 80, fig. 466 ;

Stapf in Fl Trop Afr IX (1917) 136

Holcus Sorghum Linn. Sp Pl (1753) 1047 (*partim*), Mant. II, 500

H Dora Mieg. in Act Helv. VIII (1777) 125, t 4, fig 3

H. cernuus Ard. in Saggi sc elett Acad Padova I, 128, t. III, figs. 1 and 2.

H. compactus Lam. Encycl III, 140

Andropogon compactus Brot Fl Lus I (1804) 88.

A. cernuus Roxb Fl. Ind I (1832) 270.

A. Sorghum var *cernuus* Koern in Koern & Wern Handb Getreideb. I (1885) 314.

A. Sorghum, subsp *sativus*, var *cernuus* Hack Monogr Androp. (1889) 615.

Etymology : *Cernuum* means nodding

Description : An annual. Culms stout, 3-4 m. high and more, 20-30-noded. Leaf-sheaths minutely pubescent at the nodes ; ligules very short, densely ciliate from the back ; blades linear-lanceolate, over 30 cm. by 6 cm., pale green, pubescent to tomentose inside above the ligule and outside at the junction with the sheath. Panicle erect or recurved, ovoid to oblong, very compact or somewhat loose, 10-25 cm. by 5-7.5 cm., branches rather stout below, rigid, spinulously ciliate, particularly upwards, softly ciliate to villous at the base, branches divided almost from the base, the longest 5-7.5 cm. long

Racemes compact, up to 3- or 4-noded, up to 10.6 (rarely 12.7) mm long ; joints rather stout, compressed 1 mm long, more or less white-silky-villous, pedicels very similar, of about the same length. Sessile spikelet ovate with rather broad tips, 5-3 mm. by 3-3.6 mm., pale straw-coloured with greenish tips, whitish when mature, awned. Involucreal glumes equal, coriaceous about up to the middle or at the base only, otherwise papery and often partly spongy, white-silky-villous all over or glabrous on the coriaceous portion of the back ; lower 12-nerved (with the nerves distinct upwards and sometimes with a few very delicate additional nerves interspersed), sharply 2-keeled upwards with the keels spinulously ciliate and abruptly ending, forming minute teeth between which the hyaline end of the tip protrudes, upper very broad, about 12-nerved, slightly keeled upwards. Floral glumes very densely ciliate, lower broad-ovate, 2-lobed, 4.2 mm. long, upper broad elliptic-oblong ; awn about 8.5 mm. long with the bristle half the length of the long-exserted column or more or less reduced. Anthers 3.3 mm. long. Grain equalling the glumes or more or less exserted, orbicular or orbicular-obovate in outline, more or less compressed, 4.2-5.3 mm. by 4.2 mm., white, dull ; embryo-mark indistinct. Pedicelled spikelet neuter, linear-lanceolate, 4.2 mm. long, pubescent, lower involucreal glume 11-, upper 10-nerved.

Distribution : Upper Guinea, North Central tropical Africa, N. Africa, the Orient to Turkestan and N India as far as Manipur

27. CLEISTACHNE Benth.

Tall, rather coarse grasses, annual according to Stapf, perennial according to Hook. f. Leaves long, narrow, flat, with stout midribs. Panicles narrow, more or less contracted, greyish or fulvous hairy. Spikelets solitary, all alike, hermaphrodite, pedicelled on the tough rachis of racemously arranged or panicled racemes, falling entire from the thickened tips of the pedicels.

Florets 2, lower reduced to an empty valve, upper hermaphrodite. Involucreal glumes equal, very similar, with involute margins, more or less coriaceous, delicately 7-9-nerved, mucous. Floral glumes hyaline, lower 2-nerved, upper 2-dentate or subentire, 3-nerved, with a twisted flexuous awn from the sinus or tip, palea very minute, ciliate. Lodicules 2, broad-cuneate, sparingly ciliate. Stamens 3. Stigmas laterally exserted, plumose. Grain oblong to obovoid-oblong, very obtuse or truncate ; embryo half the length of the grain.

Species 3. Western India, tropical Africa

1. *Cleistachne Stocksii* Hook. f.

PLATE 39.

Cleistachne Stocksii Hook. f. Fl. Brit. Ind. VII (1896) 163, Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 408.

Etymology : *Cleistachne* is derived from *kleistos*, shut, and *achna*, chaff, husk, alluding to the involucre glumes completely enveloping the floral glumes.—J. E. Stocks (1822-54), belonged to the Bombay Medical Staff. Travelled and collected in Sind, Baluchistan.

Description : Stem tall, stout, simple. Leaves 30-40 cm. by 12 mm. finely acuminate, softly hairy, midrib stout, margins slightly thickened, ciliate, sheath terete, ligule oblong, coriaceous.

Panicle 15-20 cm. long, long-peduncled, suberect; rachis and branches sparsely ciliate, pedicels of spikelets strigose with bright yellow hairs. Spikelets 5 mm. long, crowded, dark brown, callus short, bearded. Lower involucre glume dark brown, obscurely many-nerved, hirsute, shining, upper like lower, but narrower, nearly glabrous. Lower floral glume 2-nerved, margins infolded, tip hispid, upper a twisted awn, 16-25 mm. long, dilated at the base into a hyaline, entire, 3-nerved membrane, embracing the minute, ovate, obtuse palea.

Locality : Konkan - Tungar forest, Bassem (Bhude I).

Distribution : So far only found in Malabar on the Bababooodan Hills.

Explanation of Plate 39 : *Cleistachne Stocksii* Hook. f.

1. Part of rachis.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume and lodicules.
8. Ligule.

28. *VETIVERIA* Thouars.

Coarse, perennial, glabrous grasses; rhizomes stout; culms stout, more or less compressed below. Leaf-blades firm to hard, conduplicate in bud, then flattening out, at least upwards, gradually passing into the sheath; lower sheaths much compressed, flabellate-imbricate.

Panicles erect, long, of many-rayed whorls of slender simple or rarely compound racemes, glabrous except for the frequently bearded calli. Spikelets 2-nate, of each pair subsimilar, differing in sex, one sessile, the other pedicelled, on the articulate fragile rachis of copiously whorled (rarely panicle) peduncled 3- to many-jointed racemes, the sessile spikelets falling with the contiguous joint and the accompanying pedicelled spikelet or at least the accompanying pedicel, joints and pedicels slender, slightly and gradually thickened upwards. Florets 2, lower reduced to an empty glume, upper hermaphrodite in the sessile, male in the pedicelled spikelets. Sessile spikelet laterally slightly compressed, awned or awnless. Involucral glumes equal, lower more or less coriaceous or chartaceous with a broad rounded back and subinflexed margins, usually mucous, upper boat-shaped, keeled upwards, with broad hyaline ciliate, margins, mucous, mucronate or aristulate. Floral glumes hyaline, of lower floret 2-nerved, of upper minutely 2-dentate, mucous or mucronulate or with a perfect or imperfect awn from the sinus. Palea minute, hyaline, nerveless. Lodicules 2 glabrous. Stamens 3. Stigmas laterally exerted; styles subterminal. Grain oblong, slightly oblique at top. Pedicelled spikelet dorsally compressed; involucre glumes much thinner than in the sessile, like the floral glumes usually awnless.

Species about 7. Tropics of the Old World, one introduced into the New World.

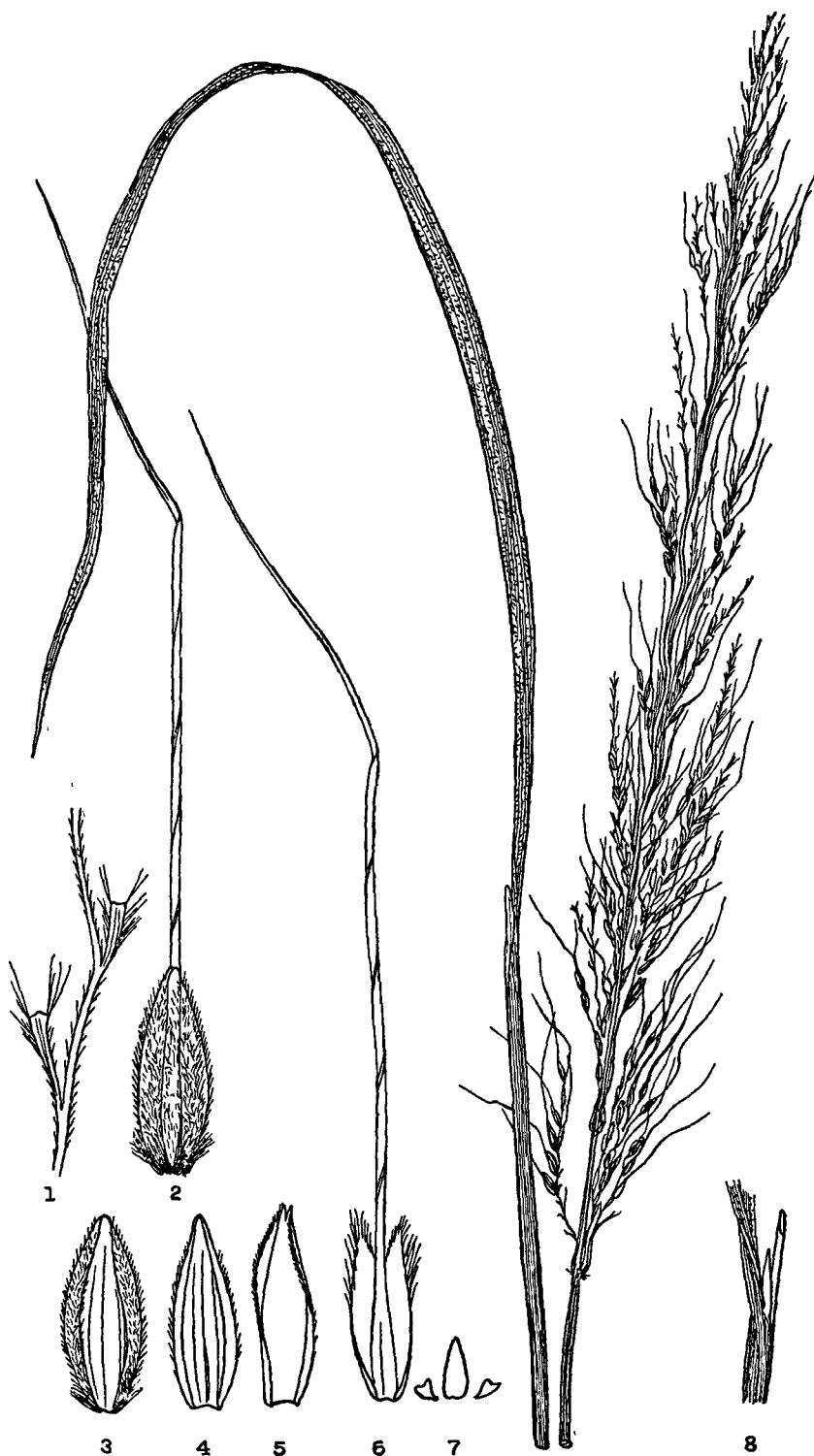
1. Leaves 5-13 cm. long. Panicle 15-18 cm. long . . . 1. *V. Lawsoni*.
2. Leaves 30-90 cm. long. Panicle up to over 30 cm. long 2. *V. zizanioides*.

1. *VETIVERIA LAWSONI* Blatter & McCann.

Vetiveria Lawsoni Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 409.

Andropogon Lawsoni Hook. f. Fl. Brit. Ind. VII (1896) 187.

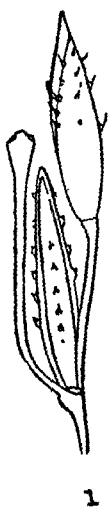
Etymology : *Vetiveria* comes from *Vetiver*, the Tamil vernacular name of the plant.—M. A. Lawson (1840-96) was Director of the Bot. Department of Ootacamund and contributed to the Fl. Brit. Ind.



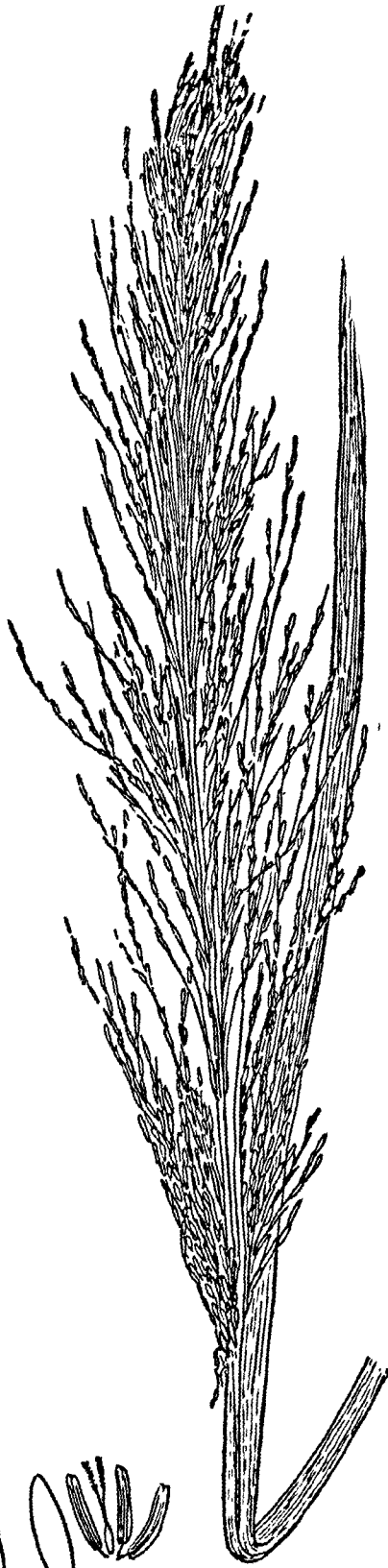
Sessile spikelet

CLEISTACHNE STOCKSII HOOK. F.

Delin: R. K. Bhide.



1



2



3



4



5



6



7

Sessile spikelet

VETIVERIA ZIZANIOIDES STAFF

Description : Rootstock stout, horizontal. Stem erect, simple, slender, internodes very long. Leaves chiefly subradical, 5-13 cm by 5 mm, exactly linear, rigid, curved, acute or obtuse, tips serrulate, base not contracted, margins ciliate, nerves 4-8, strong, sheaths compressed, of lower very short, of cauline very long, striate, ligule a ridge of hairs.

Panicle 15-18 cm long, narrow, elongate, branches or peduncles of spikes opposite and fasciated, branchlets slender, puberulous with a white scurf. Spikes 6-12 mm long, pale reddish, erect, joints 6-8, very obliquely truncate, tips obscurely ciliate, pedicels nearly equalling the spikelet, slender, compressed. Sessile spikelets 4 mm long, linear-lanceolate, callus bearded with silky hairs. Lower involucre glume linear, rigid, coriaceous, tip obtuse, bristly, keels muricate, scabrous margins inflexed, upper involucre glume cymbiform, tip 2-fid, awn longer than the glume, base ciliate, keel pectinately ciliate above the middle. Lower floral glume oblong, ciliate, nerveless, upper arched, linear, obtusely 2-dentate, awn very slender. Palea oblong, ciliate, nerveless. Anthers long. Pedicelled spikelets male, longer and narrower than the sessile, callus naked, lower involucre glume 3-nerved, awned, keels pectinately ciliate, upper acuminate, awned. Floral glumes oblong, obtuse, ciliate.

Locality : S. M. Country. Dharwar District, very common (Sedgwick 2170¹), Dharwar (McCann A277¹).

Ecology : Very abundant and the main constituent of pastures in the Mallad tract of the Carnatic.

Distribution : S. Maratha Country, Mysore.

2. VETIVERIA ZIZANIOIDES Stapf.

PLATE 40.

Vetiveria zizanioides Stapf in Kew Bull. (1906) 346-49, 362, in Fl. Trop. Afr. IX (1917) 157.

V. odorata Virey in Journ. de Pharm. 1 ser. XIII, 499.

V. arundinacea et muricata Griseb. Fl. Brit. W. Ind. (1864) 599, 560.

Phalaris zizanioides Linn. Mant. Alt. (1771) 183.

Andropogon muricatus Retz. Obs. III (1783) 43; Roxb. Fl. Ind. I (1832) 265, Grah. Cat. Bomb.

Pl. (1839) 238; Griff. Ic. Pl. As. t. 139, fig. 57, t. 155, fig. 1, Dalz. & Gibs. Bomb. Fl. (1861) 302, Duthie Grasses N. W. Ind. (1883) 90, Fodder Grasses N. Ind. (1888) 36, t. 24.

A. Festuoides J. S. Presl in C. B. Presl. Reliq. Haenk. I (1830) 340.

A. squarrosus Hack. (non Linn. f.) var. *genuinus* Hack. Monogr. Androp. (1889) 542-44.

A. squarrosus Hook. f. (non Linn. f.) in Fl. Brit. Ind. VII (1896) 186.

A. squarrosus Cooke (non Linn. f.) in Fl. Bomb. II (1908) 991.

Agrostis verticillata Lam. Ill. Gen. I, 162.

Anatherum muricatum Beauv. Agrost. Expl. Planch. (1812) 15.

J. D. Hooker and Cooke and many others have followed Hackel in calling this plant *Andropogon squarrosus* Linn. f. Stapf (in Kew Bull. 1906, 347) has explained that this name applies to quite a different plant. "No notice was taken of Scheuchzer's description or of Petiver's and Du Bois's specimens, and when Linnaeus, about 1770,¹ received the grass from Koenig he described it as something new under the name *Phalaris zizanioides*. Koenig, however, also sent specimens of the grass to Retz, who published it as *Andropogon muricatus*² in 1783. This name, which was suggested by Koenig himself, was subsequently adopted by Roxburgh and most other botanists. More recently,³ however, it has been replaced by *Andropogon squarrosus*, a name adopted by the younger Linnaeus⁴ for a plant, also communicated by Koenig, who found it "*circa Zeylonam natans supra stagna profundiora*," and entirely distinct from *Andropogon muricatus*. The specimen is still in Linnaeus' herbarium and was correctly identified by R. Brown⁵ with his *Panicum abortivum*, that is *Chamaeraphis spinescens*, a characteristic floating grass of the Indo-Malayan region. Retz⁶ himself is responsible for the erroneous reduction of *Andropogon squarrosus* to *Andropogon muricatus* which recently has been revived, although Roxburgh⁷ long ago drew attention to the confusion. '*Zizanioides*' being the earliest specific epithet, it will have to be adopted for the 'Khas Khas,' so that its name under *Vetiveria* must be "*V. zizanioides*."

Vernacular names : Vals, Ushr, Valo, Bala, Khas-Khas of the Anglo-Indians.

Etymology : *Zizanioides* means resembling *zizania* or the Greek *zizanon* which, with the ancients, was a weed in cornfields.

¹ Linnaeus, Mant. Alt. (1771) 183.

² Retz, Observ. III (1783) 43.

³ Hackel, Andropog. D. C. Monogr. Phaner., VI (1889) 542.

⁴ Linn. f. Suppl. (1781) 433.

⁵ R. Brown, Prodr. Fl. Nov. Holl. (1810) 193.

⁶ Retz, l. c., V (1780) 21.

⁷ Roxburgh, Fl. Ind. ed. Carey & Wall., I (1820) 270.

Description : A densely tufted perennial grass. Rootstock branching with spongy aromatic roots. Culms stout, up to over 1.8 m. high, usually sheathed all along. Leaf-sheaths compressed, especially the lower which are sharply keeled and fan-like, imbricate, very smooth, firm, ligules reduced to a scarious rim; blades narrowly linear, acute, 30-90 cm long, 4-2-10 6 mm wide, erect, rigid, firm or somewhat spongy, usually glabrous, rarely more or less hairy downwards on the face, pale green, midrib slender, lateral nerves close, 6 or more on each side, rather stout, slightly prominent, margin spinulously rough.

Panicle oblong, up to over 30 cm. long, usually contracted; rachis stout, smooth; whorls 6-10 with up to 20 rays; branches oblique to suberect, naked for up to 5 cm., filiform, slightly rough. Racemes up to 5 (rarely 7.5) cm long, very slender; joints about as long as the sessile spikelets or sometimes distinctly exceeding them, smooth or more or less rough, minutely and unequally ciliate at the slightly oblique tips, pedicels similar, but shorter. Sessile spikelet linear-lanceolate to almost linear, acute or subacute, 4.2-4.8 mm. long, yellowish, olive- or violet-brown or purplish to almost black; callus obtuse, under 1 mm. long, glabrous. Involucral glumes acute, coriaceous, lower mucronulate all over the back, 5-nerved, lateral nerves close, very fine; upper spinulously mucronate on the keel. Lower floral glume as long as the involucral glumes, acute, reversedly ciliate, upper up to 3.3 mm. long, narrow, oblong-lanceolate, mucronulate, ciliate. Lodicules 2, quadrate and conspicuous, though small. Styles and stigmas short. Stigmas purple. Anthers 2-3.3 mm. long. Pedicelled spikelet sparingly aculeolate or almost smooth; upper floral glume entire, acute.

Locality : *Gujarat* - Road to Lasandra (Chibber !); Daman (Bhide !), Ahmedabad, common in damp valleys (Sedgwick !).

Konkan : Ghatkopar, Horse-shoe Valley (McCann 9957 !).

N. Kanara : Dandeli (Talbot 2209 !).

Cooke & Co. classes this species amongst non-indigenous plants. We are of opinion that it is indigenous in most parts of the Presidency.

Ecology : Common on the banks of rivers and in rich marshy soil.

Distribution : Practically over the whole of India and eastwards to Burma. Occasionally cultivated. Lower Guinea in tropical Africa. Throughout the Malayan region only cultivated or as an escape. Introduced into the Mascarenes, the West Indies and Brazil.

Economic uses : The roots are woven into screens and tattees to be hung over doors or set in windows, in hot weather, when sprinkled with water, they cool and perfume the air. The root in the powdered state enters into the composition of an Abir or perfumed powder used by the Hindus at the Holi festival (Watt).

"The distillation of Vetiver oil in India seems to be of very limited extent and there is hardly any export" (Stapf).

Medicinal uses : See Dymock *Pharmacographia Indica*, III, 571, Dutt *Materia Med. Hind* (1900) 321.

Early History : See Stapf *Kew Bull.* (1906) 346-47.

Explanation of Plate 40 : *Vetiveria zizanioides* Stapf.

- | | |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume | |
| 5. Upper floral glume. | |
| 6. Palea of upper floral glume | |
| 7. Stamens, ovary, and styles. | |

29. CHRYSOPOGON Trin.

Perennial (at least in the Old World). Leaf-blades narrow.

Panicles usually lax, of whorls of simple or basally divided filiform branches, rarely the branches 2-nate or solitary. Spikelets in threes at the ends of the branchlets of terminal panicles, one sessile, the other 2 pedicelled, the three falling entire from the thickened, nearly always bearded, oblique tips of the peduncles; exceptionally 2-nate in 2-jointed racemes, one sessile, the other pedicelled, each sessile spikelet falling with the contiguous joint and its pedicelled companion, pedicels and joints, if present linear-filiform, never longitudinally grooved or appendaged. Florets 2, lower reduced to an empty glume, upper hermaphrodite in the sessile, male or neuter in the pedicelled spikelet. Sessile spikelets usually laterally compressed, awned. Involucral glumes subequal; lower coriaceous or chartaceous, involute with a rounded back or complicate and more or less keeled upwards, upper boat-shaped, more or less keeled. Floral glumes hyaline, lower 2-nerved, upper linear, entire or 2-dentate with a usually perfect awn from the sinus. Palea 0 or small, hyaline, nerveless. Lodicules 2,

small, glabrous. Stamens 3. Stigmas exerted laterally low down. Grain linear, laterally compressed; embryo half the length of the grain, scutellum linear-oblong. Pedicelled spikelet dorsally compressed, awnless or aristulate.

Species about 18.—Hot parts of the Old World, only a few entering the temperate zone. One in Florida and Cuba.

Cooke (II, 984-986) describes 4 species of *Andropogon* belonging to the section *Chrysopogon* : *A. aciculatus* Retz., *A. lancearnus* Hook. f., *A. monticola* Schult., and *A. Aucheri* Boiss.

To these we add 4 species not noted from the Presidency before : *Chrysopogon Wightianus* Nees, *Ch. asper* Heyne, *Ch. polyphyllus* Blatter & McCann, and *Ch. Gryllus* Trin

A. Pedicels of the upper spikelets half as long as the sessile spikelets or longer

I Pedicels of upper spikelets glabrous or nearly so.

1. Stems erect Leaves 15-45 cm. long . . . 1. *C. Gryllus*.
2. Stems creeping below. Leaves 2-13 cm. long . . . 2. *C. aciculatus*.

II. Pedicels of upper spikelets villous with rusty rarely pale hairs

- 1 Lower involucrel glume of pedicelled spikelets long-awned, upper not or very shortly awned.
 - a. Callus long villous all round . . . 3. *C. asper*.
 - b. Callus glabrous in front . . . 4. *C. lancearnus*.
2. Involucrel glumes of pedicelled spikelets both awned . . . 5. *C. Wightianus*.

B. Pedicel of upper spikelets not half as long as the sessile spikelets.

I. Lower sheaths compressed . . . 6. *C. montanus*.

II. Lower sheaths terete

1. Leaves, peduncle and branches of panicle glabrous . . . 7. *C. polyphyllus*
2. Leaves, peduncle and branches of panicle not glabrous . . . 8. *C. Aucheri*

1. CHRYSOPOGON GRYLLUS Trin.

PLATE 41.

Chrysopogon Gryllus Trin. Fund Agrost (1820) 188; Nees Gen. Fl. Germ. Monocot. I, t. 93; Benth Fl. Austral VII (1878) 537.

Andropogon Gryllus Lunn Cent Pl. II, 33, Hack. Monogr. Androp. (1889) 550, Host Gram. Austr. II, 1, t. 1; Sibth. Fl. Graec I t. 67, Duthie Grasses N. W Ind (1883) 22, Fodder Grasses N Ind. (1888) 40; Hook f Fl. Brit. Ind VII (1896) 187, Collett Fl Smil. (1902) 602, fig. 191.

A. echinulatus, glabratus et Royleanus Steud. Syn Pl Glum (1855) 395, 397.

Chrysopogon glabratus Trin. in Mem Acad Petersb ser. 6, II (1833) 318.

Rhaphis Gryllus Desv. Opusc (1831) 69.

R. echinulata Nees in Royle Ill. Bot. Himal. 417.

Pollinia Gryllus Spreng. Fugill. II, 10, Reichb Ic. Fl Germ t 54

Apluda Gryllus Presl Cyp & Gram Sic (1820) 55

Holcus gryllus et pallidus Br Prodr (1810) 199.

Etymology : *Chrysopogon* is derived from *chrysos*, gold, and *pogon*, beard

Description : Stems simple, forming dense hard tufts, erect, 15 cm. to 1.5 m. high; nodes smooth. Leaves 15-45 by 4-8 mm linear, acute glabrous or hirsute, margins serrulate, sheath keeled above, glabrous or pubescent.

Panicle large, 12-20 cm, rhachis angular, scabrid, axil bearded, branches long, 5-10 cm, capillary, spreading, simple or branched, usually very many in a whorl and bearing 2-4 spikes, tips obliquely truncate and densely bearded Sessile spikelets 5-8 mm., callus straight, acute. Lower involucrel glume coriaceous, 2-toothed, dorsally rounded with 2 muricate or mamillate keels or channels, shining, smooth or scaberulous, margins broadly involute, upper chartaceous, hyaline, lanceolate, mucronate or aristulate, awn equalling the spikelet or shorter, keel and sides bristly above the middle Lower floral glume linear oblong, obtuse, nerveless, upper linear, minutely 2-toothed, awn minute or 12-35 mm. long. Palea small, oblong, glabrous. Pedicelled spikelets rather longer than the sessile, terete, lanceolate, acuminate; pedicels glabrous or ciliolate. Lower involucrel glume acuminate or aristulate, 5-9-nerved, keels ciliate above, upper lanceolate, acuminate, ciliate. Floral glumes narrower, ciliate, awn of upper $\frac{1}{2}$ the size of the glume

Locality : *N. Kanara* Halyal (Talbot 2088 !).

Distribution : Temperate Himalaya from Kashmir to Sikkim, 4,000-9,000 ft. Khasia Hills, 4,000-5,000 ft, westwards to N. Africa and S. Europe, Australia.

Economic uses : Considered to be a good fodder grass in Australia.

Explanation of Plate 41 : *Chrysopogon Gryllus* Trin.

- | | |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume | |
| 3. Upper invol. glume | |
| 4. Lower floral glume. | |
| 5. Stamens, ovary and styles. | |
| 6. Upper floral glume | |

2 CHRYSOPOGON ACICULATUS Trin.

Chrysopogon aciculatus Trin. Fund. Agrost. (1820) 188, Duthie Grasses N. W. Ind. (1883) 22 (acicularis), Fodder Grasses N. Ind. (1888) 39; Benth. Fl. Hongk. (1861) 424, Fl. Austral. VII (1878) 538.

Andropogon aciculatus Retz. Obs. V (1789) 22; Roxb. Fl. Ind. I (1832) 262, Grah. Cat. Bomb. Pl. (1839) 238, Hack. Monogr. Androp. (1889) 562, Hook. f. Fl. Brit. Ind. VII (1896) 188; Cooke Fl. Bomb. II (1908) 984.

A. acicularis Willd. Sp. Pl. IV, 906.

Rhaphis acicularis Desv. Opusc. (1831) 69.

R. trivialis Lour. Fl. Cochinch. (1790) 553, Trin. Sp. Gram. Ic. t. 8, 9.

Centrophorum chinense Trin. Fund. Agrost. (1820) 106, t. 5—Rheede Hort. Mal. XII, t. 43.

Description : Rootstock woody, creeping, stems erect or ascending, 30-60 cm. long, slender, leafy chiefly at the base, lower internodes very short, the upper elongate; nodes glabrous. Leaves densely tufted, 2.5-12.5 cm. by 3-5 mm., linear, obtuse or subacute, flat or with undulate margins, glaucous, usually glabrous, the margins more or less distantly spinulose; sheaths not auricled, the lower short, the upper elongate with a more or less hairy mouth, ligule a very short membrane.

Panicles 2.5-7.5 cm. long, narrowly oblong, pale green or purplish, rachis strict, filiform, branches short, spreading, at length erect, capillary, bearing few spikelets. Sessile spikelets 3 mm. long, dorsally compressed, callus elongate, decurrent on the peduncle and with it laterally fulvously bearded. Glumes 4, lower involucreal glume chartaceous, narrowed from a broad base to the usually bimucronulate tip, dorsally convex, glabrous on the back, the keels ciliate with short stiff erect hairs, obscurely 2-3-nerved, upper involucreal glume as long, lanceolate, acuminate or aristulate, 1-nerved, the keel setosely ciliate, lower floral glume shorter, linear-oblong, obtuse, 2-nerved, upper floral glume narrow, hyaline, ciliate; awn terminal, about 5 mm. long, not twisted. Pedicellate spikelets reaching 5 mm. long, lanceolate, cuspidately acuminate, purplish; pedicels nearly as long as the sessile spikelets, flattened, glabrous except for a small tuft of hairs at the base, lower involucreal glume thin, lanceolate, acuminate, 3-nerved, upper involucreal glume a little shorter, acuminate, 3-nerved, ciliate, lower floral glume hyaline, oblong, acuminate, shorter than the involucreal glumes, nerveless; upper floral glume smaller, broader, 3-nerved, ciliate. Anthers 1.4 mm. long.

Locality : *Konkan* Ahbag, sandy shore (Ezekiel !)

N. Kanara. Karwar, seashore (Sedgwick & Bell 5070 !); Jog, hills (Hallberg & McCann A272 !)

Distribution : More or less throughout India, Ceylon, tropical Asia, Australia, Polynesia.

Economic uses : According to Haines the leaves which lie close to the ground escape to a large extent the lips of cattle. The plant is a pest on account of the sharp callus and small awns sticking to the clothes.

3 CHRYSOPOGON ASPER Heyne.

Chrysopogon asper Heyne ex Wall. Cat. no. 8784.

Andropogon asper Heyne in Herb. Rottler ex Hook. f. Fl. Brit. Ind. VII (1896) 189.

Etymology : *Asper* means rough.

Description : Stem 30-90 cm., leafy below, very slender above. Leaves distichous, 30-45 cm. by 12-18 mm., broadly linear, acute, cordate, coriaceous, flat, smooth, 11-nerved, midrib very slender, spinulose beneath, margins spinulosely serrulate, and with a few long tubercle-based cilia towards the broad semamplexicaul base, sheaths broad, compressed, laxly hirsute, lower ones 12 mm. broad, keeled, armed with scattered tubercle-based hairs.

Panicle 18 cm. long, narrow, of many whorls of short, unequal, simple, smooth, erect anthes bearing solitary rarely 2 erect spikes, tips very shortly bearded. Sessile spikelets



CHRYSOPOGON GRYLLUS TRIN.

Desm: B. K. Hyde.



Sessile spikelet
CHRYSOPOGON MONTANUS TRIN.

Delin: B.

6 mm long, pale, coriaceous, callus up to 2 mm, long, villous all round. Lower involucrel glume hispid beneath, the tip strongly compressed above, upper with the keel and sides more or less hispid above the middle awn as long as the glume or shorter. Lower floral glume shorter than the upper involucrel, narrow, obtuse, 2-nerved, ciliate, upper consisting of the linear, hyaline, 3-nerved base of the awn, awn 35-50 mm long. Pedicelled spikelets 8 mm. long, narrowly lanceolate, 7-nerved, pale shining, keels ciliate, pedicels very shortly rufous-villous on both margins, excised at the tip in a semicircle; lower involucrel glume thin, tip 2-dentate, nerves strong, subequidistant, or the 3 lateral on each side submarginal, margins narrowly incurved, keels ciliate from base to tip, upper lanceolate, acuminate, 3-nerved, ciliate. Lower floral glume linear-oblong, 2-nerved, ciliate, upper narrowly lanceolate, 1-nerved.

Locality : N. Kanara : Tinai (Talbot 2564 !).

Distribution : Madras Pulicat Hills, N. Kanara.

4. CHRYSOPOGON LANCEARIUS Haines

Chrysopogon lancearius Haines in Haines Bot. Bih. and Or. (1924) 1036

Andropogon lancearius Hook. f. Fl. Brit. Ind. VII (1896) 190, Cooke Fl. Bomb. II (1908) 985.

Description : Stem 60-90 cm. high or more, leafy upwards, nodes glabrous. Leaves 30-35 cm. by 8-13 mm., lanceolate, acuminate, narrowed from below the middle to the base, smooth on both surfaces, flat, midrib broad, white above, margins minutely spinulose, sheaths keeled, quite glabrous, ligule a row of fine short hairs.

Panicle 15 cm. long, narrow, of many whorls of simple smooth erect branches bearing solitary erect racemes. Sessile spikelets 6 mm. long, callus about 1.5 mm long, glabrous in front. Glumes 4, lower involucrel glume nearly 6 mm. long, oblong, chartaceous, truncate or notched, obscurely 5-nerved, upper involucrel glume 5 mm. long, oblong, chartaceous, shortly ciliate on the keels, otherwise glabrous, cleft at the apex into 2 acute lobes, lower floral glume 4 mm long, linear-oblong, obtuse, hyaline, upper floral glume 2.5 mm. long, linear, hyaline; awn 4 cm. long, the column much twisted and densely hairy with reddish brown hairs. Pedicellate spikelets nearly 8 mm. long (not including the awn), lanceolate, acute, awned, pedicels nearly white, 4 mm. long, flattened, ciliate with long reddish brown hairs. Lower involucrel glume lanceolate, acute, 2-toothed at the tip, with an awn about 2.5 mm long, between the acicular teeth, 7-nerved, membranous, glabrous, upper involucrel glume as long as the lower, lanceolate, acuminate, membranous, 5-nerved, lower floral glume shorter, linear-oblong, obtuse, ciliate, hyaline, upper floral glume hyaline.

Locality : W. Ghats. Panchgani (Blatter & Hallberg B1230 !), Castle Rock (Woodrow). Seems to be very rare in the Presidency.

Distribution : Sikkim Himalaya, Bihar, Chota Nagpur, Orissa, W. Peninsula.

Economic uses : A good fodder according to Haines.

5. CHRYSOPOGON WIGHTIANUS Nees.

Chrysopogon Wightianus Nees ex Steud. Syn. Pl. Glum. (1855) 397.

Andropogon Wightianus Steud. l. c. 395, Hook. f. Fl. Brit. Ind. VII (1896) 191.

A. aristulatus Hochst. ex Steud. l. c. 397, Hack. Monogr. Androp. (1889) 556

A. breviaristatus Steud. l. c. 396

Rhaphis orientalis Desv. Opusc. (1831) 69.

R. Wightianus Nees ex Steud. l. c.

Etymology : *Wightianus*, given in honour of Robert Wight (1796-1872), Superintendent of the Botanical Gardens, Madras, author of numerous botanical works.

Description : Very variable in habit. Stems short or long, erect or ascending from a short stout creeping stock. Leaves 7-25 cm. long, linear, acute, rigid, from glabrous to pubescent on both surfaces and with sometimes tubercle-based hairs, spinulosely serrulate, sheaths, glabrous, lower ones compressed, ligule very short, villous.

Panicle 7-13 cm. long, contracted, lower branches long, few in a whorl, rachis and branches minutely hairy, spikes solitary, green or brownish. Sessile spikelets subcylindric, 4 mm. long, callus long, densely bearded with rusty hairs all round. Lower involucrel glume laterally compressed above, minutely truncate, glabrous below, hispid above, obscurely 4-nerved, tip 2-dentate, upper chartaceous, hispid above on the keel and sides, tip 2-lobed, awn as long as the glume or shorter. Lower floral glume linear-oblong, 2-nerved, ciliate, upper consisting of an awn with a narrowly dilated 2-lobed base, awn 50-65 mm. long, column hispid. Pedicelled spikelets nearly 12 mm. long, lanceolate, pubescent, pedicel truncate, margins shortly villous. Lower involucrel glume glabrous or pubescent, 7-nerved, awn longer than the glume, keels ciliate, upper lanceolate, 3-nerved, awn as long as the glume or shorter. Lower floral glume oblong, 2-nerved, ciliate, upper very narrow, ciliate, nerveless.

Locality : *W. Ghats* : Castle Rock (Bhide !).

N. Kanara : Jog to Siddhapur, open grass-land (McCann A273 !).

Distribution : Madras, Nilgiris, Burma, Assam. (Hackel mentions a specimen gathered in Ceylon but, according to Hooker f. it seems to be a starved specimen of *Chrysopogon zeylanicus* Thw.).

6. CHRYSOPOGON MONTANUS Trin.

PLATE 42

Chrysopogon montanus Trin. in Spreng. Neue Entdeck. II (1820-22) 93; Haines Bot. Bih. and Or. (1924) 1037.

Andropogon monticola Schult. Mant. (1824) 665; Kunth Enum. Pl. I (1838) 506; Steud. Syn.

Pl. Glum. (1855) 395, Hack. Monogr. Androp. (1889) 557 (excl. var. *velutinus*); Hook. f.

Fl. Brit. Ind. VII (1896) 192, cum omnibus var., Cooke Fl. Bomb. II (1908) 985; Hole

in Ind. Forest Mem. I (1911) 108.

A. Sprengelii Kunth Rev. Gram. (1829) 166.

Pollinia fulva Spreng. Pugill. II, 93

Andropogon Trinii Steud. Syn. Pl. Glum. (1854) 395; Hack. Monogr. Androp. (1889) 558

A. ciliolatus, caeruleus et increscens, Steud. l. c.

Chrysopogon ciliolatus Boiss. Fl. Or. V (1884) 458 (excl. var. *Auchers* Boiss.); Duthie Grasses.

N. W. Ind. (1883) 22.

C. caeruleus Duthie l. c. 23, Fodder Grasses N. Ind. (1888) 39, t. 60.

C. increscens Nees ex Steud. l. c. 396.

C. Wightianus var. *leucanthus* Thw. Enum. Pl. Zeyl. (1864) 366.

C. serrulatus Trin. in Mem. Ac. Petersb. ser. 6, II (1833) 318, Spec. Gram. t. 331.

C. Eschbeckii Arn. in Steud. Syn. (1856) 395.

Rhaphis ciliolata et coerules Nees ex Steud. l. c. 396, 395.

This synonymy requires an explanation. *Chrysopogon montanus* Trin. as understood in this place comprises Hackel's two species *Andropogon monticola* Schult. and *A. Trinii* Steud., and is identical with Hook. f.'s *A. monticola* Schult. with all its varieties.

Hackel has two species and he distinguishes them by the following characters :

A. monticola. Upper involucreal glume of sessile spikelet keeled, the keel from the base up to $\frac{3}{4}$ of its length densely pectinate ciliate with long, rigid, rufous hairs, shortly white hispid in the upper $\frac{1}{4}$.

A. Trinii. Upper involucreal glume of sessile spikelet keeled below the apex only, keel white-ciliate, the lower $\frac{3}{4}$ not keeled and glabrous.

Hook. f. in F. B. I. makes of these species two varieties : var. *monticola* proper and var. *Trinii*, and includes them under *A. monticola* Schult., adding a third variety : var. *robustus*.

At the same time Hooker confesses : " I am unable to classify the varieties of this common and variable plant in accordance with geographical areas or other considerations. This, if possible, must be effected by field-botanists in India. There is every gradation from the coarsely hirsute keel of *monticola*, to the perfectly smooth of some states of *Trinii*, from the awnless to long awned gl. I of the pedicelled spikelets, and from the glabrous to the pubescent of the same organ : the colour of which affords no character ; nor does its length, or that of the cilia on its keels."

Cooke (II, 985) has adopted the name *A. monticola* Schult. with Hooker's description and evidently also the latter's varieties. But his opinion does not count in this case as he has not seen any specimens from the Bombay Presidency and " was therefore " as he says himself, " unable to fix definitely the variety to which the Bombay species belong. They will probably belong to var. *Trinii*, H. f." What induced Cooke to say that they probably belong to var. *Trinii*, we cannot understand, especially as Hooker came to the conclusion that he was not able to classify the varieties according to geographical areas.

We have examined a great number of specimens from all parts of the Presidency, except Sind, Cutch and Kathiawar and we have been able to separate many into the two varieties. They exhibit almost the same distribution and often both are found in the same locality, with this exception that var. *Trinii* has not been observed in N. Kanara, Gujarat and the Konkan. But we must also mention, and this is the most important point, that we saw many specimens all over the country which could not be classed under either variety, and it would require many new varieties if we wanted to give a name to all the different variations. And even then they would be forms only and not varieties.

Haines seems to have felt the same difficulty when he tried to classify the *montanus* material of Bihar and Orissa. He distinguishes 5 forms. If we wanted to follow the same method for our area, we doubt whether double the number of forms would yield satisfactory results.

Stapf describes the specimens from tropical Africa under the name of *C. montanus* Var *tremulus* Stapf. He calls it "one of the several races which constitute the rather polymorphic species *C. montanus* Trin., whose area includes Southern Africa, Madagascar and India. The var. *tremulus* approaches very closely the var. *elator* Stapf, a large-spikeleted parallel to the var. *serrulatus* Stapf (*Chrysopogon serrulatus* Trin.) and differs from it apparently only in the almost quite smooth rhachis and branchlets (a few sharp-pointed hairs may be found under a high power) and the pedicels, which are glabrous almost up to the middle, and not ciliate from the base." It seems to us (it may look like presumption on our part to criticise our veteran and highly merited agrostologist) that it is somewhat risky to find new varieties of a protean species on a few specimens only.

According to Hole all the 3 varieties mentioned by Hooker "appear to vary greatly, as regards their habit and vigour of growth, in response to the moisture conditions of the habitat and also according as whether, or not, the plants are habitually grazed, cut for fodder, or periodically burnt. The colour of the culm of glume II of the sessile spikelet (pale or white in *robustus* and rufous in *monticola*), accordingly, appears to be the chief difference in the habit, and these forms appear to have different and fairly defined areas of distribution (*monticola* occurring chiefly in Central and Southern India, while *robustus* is mainly found in N. India, in the outer N. W. Himalayas and Sub-Himalayan tract" Hole who studied the varieties *robustus* and *Trinii* both from herbarium specimens and in the field has observed that the plant at Dehra Dun gradually and imperceptibly passes from the typical *robustus* to the typical *Trinii*. We are justified in stating that a similar transition takes place between *monticola* and *Trinii* in Western India. (Of Central and Southern India we have no experience.) We have therefore a gradual transition from *robustus* to *Trinii* at Dehra Dun, and from *Trinii* to *monticola* in W. India and, consequently, we are not allowed to consider Hooker's varieties as good varieties.

Vernacular names: Sunthia khad, Agiva, Gogar, Ghora, Dand, Pandhari kusal, Kare hullu.

Etymology : *Montanus* refers to hilly country liked by this plant.

Description : A very variable perennial grass. Stems usually slender, erect or geniculately ascending, glabrous, sometimes robust simple or branched, 30 cm. to 1.2 m., but often attaining 2 m., slightly compressed, solid, developing usually axillary leafy and flowering branches from all the upper nodes except the one next below the panicle. (The branches growing within the sheaths push the latter away from the stem which often results in a characteristic fan-shaped appearance.) Blade of uppermost leaf of flowering stem usually mucroniform, but attaining 8 cm., of lower leaves up to 43 cm. long and 8 mm. broad, linear acuminate, tapering from the base, scabrid on margins, sometimes also scabrid dorsally on midrib, and scaberulous above, especially towards the apex, often ciliate towards the base with tubercle-based hairs, at least when young, sheath glabrous, compressed, keeled, especially of the lower leaves, shorter or longer than the proper internode, ligule a minute membranous rim.

Panicle 5-15 cm. long, ovate to subcylindric, yellowish to purplish, of several whorls of few or many capillary flexuous very unequal branches bearing solitary spikes, branches of flowering panicle more or less horizontally spreading, of the fruiting panicle erect and closely appressed to the rhachis, rhachis and branches smooth or scaberulous. Spikelets in clusters of 3, a central sessile hermaphrodite one with 2 lateral pedicelled male ones, the clusters being terminal and solitary on the capillary branches of the panicle. Sessile spikelets laterally compressed, 4-7 mm. long, tip of peduncle brown-bearded, clavate, callus short, with oval scar and dense beard. Lower involucre glume laterally compressed, narrow-oblong, embracing the margins of the upper, chartaceous, 2-4-nerved, hispidly ciliate dorsally on keel towards the apex or almost glabrous, often scaberulous dorsally on nerves and minutely pubescent with appressed hairs dorsally near margin, apex subtruncate or 2-dentate. Upper involucre glume laterally compressed, broader than lower, obtusely keeled, subcoriaceous, 3-nerved, margins broad, hyaline, membranous, ciliate or not, very variable with regard to its hairiness, sometimes almost glabrous, at other times hispidly ciliate dorsally on keel with long white or rufous hairs more or less from base to apex, sometimes also pubescent, or minutely villous dorsally on keel and lateral nerves, awned, awn 2.5-6 mm. long, apex entire or 2-lobed. Lower floral glume $\frac{1}{2}$ the length of to subequal the upper involucre glume, linear, hyaline, ciliate, nerveless or indistinctly 1-3- or more-nerved, apex obtuse. Upper floral glume consisting of the narrow 3-nerved base of the awn, basal half or $\frac{3}{4}$ hyaline, membranous, upper portion chartaceous, awn geniculate, 10-18 mm. long, but also reaching 37 mm. (including the twisted column), margins ciliate or not, apex entire or 2-lobed. Palea sometimes present, very narrow, 1.25 mm. long. Lodicules 2, connate, glabrous. Anthers 3, up to 3 mm. long, yellow or purple. Stigmas 2, laterally exerted at base of spikelet, yellow. Pedicelled spikelet dorsally compressed, subequal the sessile spikelet; pedicel less than half the sessile spikelet, usually about $\frac{1}{2}$ the spikelet, densely ciliate on both

margins with stiff rufous or white hairs, the upper of which are shorter than to subequal the spikelet. Lower involucre glume lanceolate, membranous, 5-7-nerved, minutely pubescent with appressed hairs dorsally, especially towards the apex, or almost glabrous, sometimes ciliate dorsally on midrib and marginal nerves, especially towards the apex, acute or shortly awned. Upper involucre glume subequal to the lower, 3-nerved, margins incurved, long ciliate apex acute or mucronate, glabrous dorsally. Floral glumes linear, hyaline, ciliate, nerveless or indistinctly nerved. Palea sometimes present, as in sessile spikelet, but slightly longer, very narrow.

The flowers are much visited by small bees.

Locality : Gujarat. Mahal-Dangs, 800 ft., rainfall 100 in (Sedgwick & Bell 5391 !).

Khandesh Tapti River (Blatter & Hallberg 5476 !), Blusawal (McCann 5224A !), Nandgaum, Bori River (Blatter & Hallberg 3827 !); Bori, Tapti Island (Blatter & Hallberg 5146 !), Amalner, Bori River (Blatter & Hallberg 4455 !)

Konkan Sion Creek (Sabins A231 !).

W. Ghats Matheran (D'Almeida 9958 !).

Deccan Khandala to Karjat (Blatter & Hallberg A232 !), Kurkee (Talbot !); Pashan (Gammie !), Mangri, 8 miles E of Poona (Gammie !), Katraj (Gammie !), Pasarni Ghat (Blatter & Hallberg B1209 !).

S M Country Dumbai (Talbot 2317 !), Badam (Talbot 2926 !), N. W. of Dharwar (Sedgwick 3141 !), Dharwar, dry pasture land, 2,400 ft., rainfall 34 in. (Sedgwick 1817 !), Konankeri, 1,800 ft., rainfall 35 in. (Sedgwick & Bell 4139 !), Haveri (Talbot 2189 !).

N Kanara Jog to Sidhapur, open grass-land (Hallberg & McCann A274 !).

Ecology : This plant forms patches of mahv individuals, or combines with different individuals to form associations of a few species. Found generally on dry sandy or stony soil with little capacity for holding water. See also Hole 1 c. 112-14.

Distribution : Throughout India, especially in hilly tracts, from the N. W. Himalaya southwards, ascending to 6,000 ft., extends to Ceylon, Burma, Afghanistan, tropical S. Africa, Madagascar.

Economic uses : In Bihar and Orissa this grass is considered to be a valuable fodder, and Hole, writing of the Siwalik Division, calls it one of the most valuable fodder grasses. In Mount Abu, according to Lisboa, it is reckoned as a good fodder grass and the grain is used as food by the natives. But the same writer, under the name of *Andropogon serrulatus* Trin. (= *Chrysopogon montanus* var. *Trinu*) remarks "Said to be good fodder, used much in Poona but reports from other places unfavourable." (J. C. Lisboa, List of Bombay Grasses. Bombay (1896), 81.)

The last statement might find an explanation by a suggestive note made by Hole (l. c. 111) : "So far as the local (Dehra Dun) plant is concerned specimens with the more hairy glume II tend to occur in localities where there is a scarcity of available moisture, both on the dry ridges and slopes of the Siwalik Hills and also (rarely) on waterlogged soil, and the writer believes that the characters which have been utilized to define these varieties vary in response to the factors of the habitat and particularly in response to the available water supply. Provided that the development of the plants has not been interfered with by grazing, grass-cutting, or other agency, those plants with the more hairy glume II are usually less robust and less coarse or rank, than the others, and they are therefore as a rule most valued for fodder and are distinguished locally by the vernacular name of dhaula, whereas the coarser plants with smooth glume are called gurla. As this grass affords a valuable fodder and is sometimes cultivated, in consequence, it is important to determine the extent to which its characteristics are constant. If, as suggested above, they depend on the available moisture, it is obvious that cultivation of this grass on good agricultural land, with a large quantity of available moisture, would result in producing an inferior class of rank, coarse fodder."

Explanation of Plate 42 : *Chrysopogon montanus* Trin

- | | |
|--|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol glume. | |
| 3. Upper invol glume. | |
| 4. Lower floral glume | |
| 5. Upper floral glume. | |
| 6 Stamens, ovary, styles and lodicules | |

7. *CHRYSOPOGON POLYPHYLLUS* Blatter & McCann.

PLATE 43.

Chrysopogon polyphyllus Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 416.

Andropogon polyphyllus Hack. ex Hook. f. Fl. Brit. Ind. VII (1896) 194.

A. Aucheri var. *polyphyllus* Hack. in Herb. Duthie (ex Hook. f. l. c.)

Etymology : *Polyphyllus* means many-leaved.



3 4 5 6

Sessile spikelet

CHRYSOPOGON POLYPHYLLUS BLATTER & McCANN.

Detm: B. K. Bhad



CHRYSOPOGON AUCHERI STAPF.

Delin : B. K. Bhad

Description : Stem 60-90 cm. high, as thick as a crow-quill or more, stiff, simple or fastigately branched, quite glabrous. Leaves crowded or not, 15-25 cm. by 2-4 mm., narrow, rigid, acuminate, flat, pale glaucous-green, glabrous on both surfaces, coriaceous, midrib and nerves very slender, margins minutely scaberulous, sheaths terete, appressed, hard.

Panicle 10-13 cm. long, oblong, subsecund, dense-flowered, very pale, branches 6-12 mm., very unequal, in many closely approximate whorls, smooth, peduncle slender, quite glabrous. Sessile spikelets 4 mm. long, drooping, white or pale purplish, callus long, $1\frac{1}{2}$ mm. long, obtuse, bearded at the very base only with long fulvous hairs. Glumes as in *C. montanus*. Lower involucre glume obtuse, glabrous, keel ciliate towards the tip; upper not awned, keel glabrous or ciliate. Upper floral glume with an awn 3-8 mm. long, nearly straight, pale. Pedicelled spikelets narrowly lanceolate, acuminate, glabrous, 7-nerved, eciliate, not awned, rather longer than the sessile, pedicels naked, villous at the tip only.

Can easily be distinguished from *C. montanus* by the stout naked callus which is bearded at the base only, and by the naked pedicels which are long villous only at the tip.

Locality : *Kathnawar* : Porbandar (Bhude ¹).

Gujarat : Dohad (Bhude ¹), Watrak River on rocks (Sedgwick 1165 ¹); Daman (Bhude).

Deccan : Dhond, river-bank (Bhude ¹).

Distribution : Central Provinces, W. Peninsula.

Explanation of Plate 43 : *Chrysopogon polyphyllus* Blatter & McCann.

- | | |
|--------------------------------------|---------------------|
| 1. Pedicel. | |
| 2. Pedicelled and sessile spikelets. | |
| 3. Lower invol. glume. | |
| 4. Upper invol. glume | } Sessile spikelet. |
| 5. Lower floral glume | |
| 6. Upper floral glume. | |

8. CHRYSOPOGON AUCHERI Stapf.

PLATE 44

Chrysopogon Aucheri Stapf in Kew Bull. (1907) 211

Andropogon Aucheri Boiss. Diag. ser. 1, fasc. 5 (1844) 77, Hook. f. Fl. Brit. Ind. VII (1896)

195, Cooke Fl. Bomb. II (1908) 986

A. Aucheri var. *genuinus* Hack Monogr. Androp. (1889) 560

Chrysopogon ciliolatus var. *Aucheri* Boiss. Fl. Or. V (1884) 458

Etymology : *Aucheri*, after Aucher Eloy a French Botanist who explored the Orient from 1830 onwards.

Description : Densely tufted, stems 15-45 cm. long, simple or sparingly branched, base thickened, nodes glabrous. Leaves 5-10 cm. by 2.5-4 mm., linear, acute or acuminate, more or less pubescent, sometimes undulate, pale green, often ciliate near the base with bulbous-based hairs; sheaths usually glabrous, very pale, with a few hairs at the mouth, ligule a hairy ridge.

Panicle 5-7.5 cm. long, branches in whorls of 4-6, spreading, then suberect; racemes usually crowded, rarely 2-nate on a branch. Sessile spikelets 6 mm. long; callus 1.5 mm. long, villous all over with long silky hairs; lower involucre glume 5 mm. long, linear, with 2 short acicular teeth at the apex, minutely ciliate on the margins, obscurely 5-nerved, chartaceous, upper involucre glume as long as the lower, oblong, obtuse, 1-nerved, chartaceous, with hyaline margins, the keel ciliate above the middle with long silky hairs, and with a slender awn 8 mm. long, the awn ciliate below the middle with long hairs, lower floral glume linear, obtuse, hyaline; upper floral glume represented by the dilated base of the awn, awn 2-2 cm. long, base hyaline, dilated. Pedicellate spikelets slightly longer than the sessile, linear-lanceolate, acute; pedicels cuneate, silky-villous from base to apex, less than half as long as the sessile spikelets; lower involucre glume lanceolate, acute, 6 mm. long, 7-nerved, upper involucre glume lanceolate, acuminate, 3-nerved; lower floral glume shorter, hyaline, oblong, acute; upper floral glume lanceolate, acute, 1-nerved, hyaline. Anthers 3 mm. long.

Stapf thinks that *C. Aucheri* comprises several geographical races and that the one from which the species was first described extends from Arabia through Southern Persia and Baluchistan to Sind. He characterises it 'by the lower glume of the pedicelled spikelet being usually awnless or in any case much more shortly awned than the upper, by the glume awns not being ciliate or ciliate only at the base, and by the longer beards of the pedicels.'

Locality : Sind : Gizz (Sabnis B777 ¹); Jemadar ka Landa, near Karachi (Stocks).

Distribution : Sind, Baluchistan, Afghanistan, S. Persia, Arabia (not Africa).

Explanation of Plate 44 : *Chrysopogon Aucher* Stapf.

- | | |
|---|--------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet |
| 2. Lower invol. glume | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume | |
| 5. Upper floral glume. | |
| 6. Stamens, ovary, styles, and lodicules. | |

30. *ARTHRAOXON* Beauv.

Annual or perennial slender grasses ; stems decumbent, creeping and branching below. Leaves short, broad, cordate at the base, sheaths shorter than the internodes.

Racemes 2-nate, digitate or fasciculate, rhachis very slender, articulate, fragile. Spikelets 1-flowered, secund, sessile, solitary or with an imperfect pedicellate spikelet, laterally compressed, deciduous at the internodes, callus bearded. Glumes 4 ; lower involucrel glume lanceolate or linear-lanceolate, acute, thin or subcoriaceous, more or less muriculate or aculeate, margins hardly incurved ; upper involucrel glume narrower, lanceolate, acuminate, chartaceous, keeled ; lower floral glume hyaline, paleate, empty ; upper floral glume hyaline, awned or mucronate, bisexual ; pales minute or 0. Lodicules 2, cuneate or quadrate. Stamens 1-3. Styles short ; stigmas laterally exserted. Grain linear or narrowly fusiform.

Species about 20, in the tropical and subtropical regions of the Old World.

The species of this genus are purely monsoon grasses, vegetating during the rains and putting forth a profusion of flowers in late September, usually towards the end, or early October.

We are of opinion that the species of this genus are in need of revision. A study of the juvenile forms will throw much light on the subject as there appears to be a considerable amount of variation between the young and mature states.

We retain the 6 species mentioned by Cooke l. c. His *A. lanceolatus* Hochst. will be slightly restricted under the name of *A. serrulatus* Hochst., and the name *A. lancifolius* Hochst. will be substituted for *A. microphyllus* Hochst. and *A. quartimanus* Nash will take the place of *A. ciliaris* Beauv.

- I. Awn of spikelets less than 2.5 cm. long ; joints of rhachis of racemes rectangularly truncate.

A. Stamens 3 ; anthers nearly as long as the upper floral glume.

- | | |
|--|------------------------|
| 1. Spikelets all sessile (not pedicellate) | 1. <i>A. inermis</i> . |
| 2. Spikelets sessile and pedicellate. | |

a. Tall, reaching 90 cm. high ; joints of rhachis sparsely hairy ; lower involucrel glume acuminate	2. <i>A. serrulatus</i> .
---	---------------------------

b. A weak grass reaching 30 cm. high ; joints of rhachis densely clothed with silvery hairs ; lower involucrel glume 2-fid.	3. <i>A. Meeboldii</i> .
---	--------------------------

B. Stamens 2 or 3 ; anthers not half the length of the upper floral glume.

- | | |
|--|----------------------------|
| 1. Lower involucrel glume 2-fid | 4. <i>A. lancifolius</i> . |
| 2. Lower involucrel glume entire | 5. <i>A. quartimanus</i> . |

- II. Awn of spikelets 1.5 cm. or more long ; joints of rhachis of racemes obliquely truncate

6. *A. jubatus*.

1. *ARTHRAOXON INERMIS* Hook. f.**PLATE 45.**

Arthraxon inermis Hook. f. Fl. Brit. Ind. VII (1896) 145 ; Lisboa Bomb. Grasses (1896) 60 ; Cooke Fl. Bomb. II (1908) 968.

Vernacular name : Vanguaria.

Etymology : *Inermis* means unarmed.

Description : Stems very slender, much geniculately branched, glabrous ; nodes pubescent. Leaves 2.5-3.8 by 1-1.6 cm., ovate, broadly amplexicaul, caudate-acuminate with setaceous tips, glabrous or sparsely hairy on both sides, ciliate near the base.

Spikes often 3, short, green ; peduncle slender, naked. Spikelets oblong-lanceolate, all sessile (none pedicellate), rather distant. Glumes 3 or 4 ; lower involucrel glume dorsally con-



Sessile spikelet

ARTHRAXON INERMIS HOOK F

Delin · B. K. Bhide.



Sessile spikelet
ARTHRAXON SERRULATUS HOCHST.

vex, obtuse, oblong-lanceolate, strongly 7-9-nerved, the margins not incurved and as well as the nerves scabrid; upper involucreal glume as long as the lower, obovate-oblong (when spread out), obtuse, emarginate, apiculate, 3-nerved, hardly keeled, nearly smooth; lower floral glume 0 (or palea of upper floral glume) shorter than the upper involucreal glume, lanceolate; awn basal, twice as long as the spikelets. Anthers very large.

Locality : *Konkan* : Okda Forest, Thana Dist. (Ryan 718 !); Wada Range, Thana Dist. (Ryan 692 !).

W. Ghats : Matheran (Woodrow !); Khandala (McCann 9950 !, 9740 !); Marmagao (McCann !); Mahabaleshwar (Sedgwick & Bell 4513 !, Woodrow); Panchgam (Lisboa); Castle Rock (Gammie 15678 !).

Deccan . Purandhar (McCann 5592 !).

S. M. Country : Derikop, woods (Sedgwick 1845 !).

N. Kanara (Sedgwick).

Ecology : A subregiarious plant. In the Kanara forests above Ghats common.

Distribution : W. Peninsula, apparently endemic.

Explanation of Plate 45 : *Arthraxon vermis* Hook. f.

1. Spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Stamens, ovary and styles.

2. *ARTHRAOXON SERRULATUS* Hochst.

PLATE 46

Arthraxon serrulatus Hochst. in Flora (1856) 188; Stapf in Fl. Trop. Afr. IX (1917) 163.

A. lanceolatus Hack. Monogr. Androp. (1889) 348 (excl. var. *echinatus*); Duthie Grasses N. W. Ind. (1883) 17; Hook. f. Fl. Brit. Ind. VII (1896) 143 (partim, excl. *Batratherum echinatum* Nees in Edinb. Phil. Journ. XVIII (1835) 181).

Andropogon echinatus Heyne ex Steud. Nomencl. ed. 2 (1840) 91.

Arthraxon echinatus Hochst. in Flora (1856) 188.

Andropogon lanceolatus Roxb. Fl. Ind. I (1832) 257; Cooke Fl. Bomb. II (1908) 968 (partim).

A. lanceolatus, var. *geminus*, subvar. *serrulatus* Schweinf. in Bull. Herb. Boiss., 2 ser. II, 10.

A. serrulatus Link Hort. Berol. I (1809) 241 (quoad specimen, descriptio partim erronea ?); A. Rich. Tent. Fl. Abyss. II (1851) 458.

A. prionodes Steud. Syn. Pl. Glum. I (1855) 383.

Batratherum lanceolatum Nees in Edinb. New Phil. Journ. XVIII (1835) 181.

B. serrulatum Hochst. ex Steud. l. c.

Vernacular names : Harjala, Govinder.

Description : A perennial grass, rhizome short, emitting fascicles of closely set culms and innovation-shoots, which are more or less thickened below and covered with reddish silky cataphylls. Stems rather slender, up to 90 cm. high, many-noded, usually finely pubescent, sometimes glabrous, with vegetative branches below and usually solitary flowering branches above, the latter subfastigate. Leaf-blades lanceolate to ovate-lanceolate, setaceously acuminate, with a caudate amplexicaul base, glaucous or greenish 2.5-3 cm. long 12-18 mm. wide, margins cartilaginous, ciliate with the cilia springing from tubercles, smooth, very finely pubescent below or glabrous, primary lateral nerves about 8-11 on each side, fine, slightly raised below; ligule 1-2 mm. long, rounded, membranous; sheaths terete, tight, slightly shorter than the internodes or exceeding them in the leafy shoots, more or less hairy with tubercle-based hairs and often softly pubescent at the nodes, the uppermost frequently glabrous.

Racemes 2-5-nate, slender, greenish or suffused with purple or violet, 3 to over 5 cm. long on a short common axis, the fascicles borne on a slender peduncle, shortly or far exserted from the supporting bladeless or almost bladeless sheath; rhachis fragile, shortly bearded at the nodes; joints narrowly linear, 3.3-6.3 mm. long, hairy on the back and sides, or the lowest almost glabrous, hairs increasing upwards to more than 2 mm.; pedicels very similar, but much shorter and more slender. Sessile spikelets narrowly lanceolate-linear to linear, slightly tapering upwards, up to 7.4 mm. long (not including the awn), glabrous; callus very short, puberulous. Glumes 4. Lower involucreal glume chartaceous, 6 mm. long, lanceolate, with a minutely truncate hyaline tip, very convex on the back, which is smooth or more often muricate along the 4 indistinct or faintly raised inner, spinulosely muricate along the outer nerves, margins hyaline,

comparatively wide; upper linear-lanceolate in profile, membranous, 3-nerved, glabrous or nearly so. Lower floral glume linear, acute, up to 4 mm. long, hyaline, nerveless or obscurely 1-nerved at the base; upper membranous at the base, hyaline upwards, narrowly lanceolate-linear in profile, 2-dentate, with the teeth minute, sometimes produced into short capillary bristles, delicately 3-nerved, awned from near the base, awn 8-15 mm. long, very fine, knee about the middle, twisted below. Anthers up to 3 mm. long. Grain bacilliform, about 4.2 mm. long. Pedicelled spikelet male, linear-lanceolate, acute, about 5 mm. long. Involucral glumes subequal, lower herbaceous-chartaceous, acute, scaberrulous along the outer and slightly so on the 4-5 inner nerves or almost smooth, upper slightly shorter, membranous, otherwise as in the sessile spikelet. Lower floral glume as in the sessile spikelet, upper linear-oblong, obtuse, nerveless, mucous.

This species includes all the material of the Nileland or tropical Africa, of tropical Arabia and the greater part of the Indian specimens which, up to now, were ranged under *Arthraxon lanceolatus* Hochst. as understood by most authors.

It has been pointed out by Stapf that *Arthraxon lanceolatus* Hochst., was founded on *Andropogon lanceolatus* Roxb., a Coromandel plant, which has larger and wider long-awned spikelets, with the lower involucral glume very minutely muricate towards the tips only. Neither of these names can, consequently, be mentioned as synonyms of *Arthraxon serrulatus*.

Locality : Sind (Stocks 642).

Kathiawar : Morvi (Woodrow).

W. Ghats : Lonavla (Woodrow); Panchgani (Blatter & Hallberg B1277 !); Kamalgad Fort (Fernandez 1767 !).

Deccan : Pashan, tank (Gammie !)

S. M. Country : S. W. of Dharwar (Sedgwick & Bell 4436 !); Derkop (Sedgwick 2022 !); Belgaum, Fort wall (Sedgwick 3013 !).

Ecology : Subgregarious. Very common on banks in the Mallad tract of the Carnatic.

Distribution : More or less throughout India, tropical Arabia and tropical Africa (Nileland).

Explanation of Plate 46 : *Arthraxon serrulatus* Hochst.

1. Ligule.
2. Spikelets.
3. Upper invol. glume.
4. Lower invol. glume.
5. Stamens, ovary, styles and lodicules.
6. Upper floral glume.

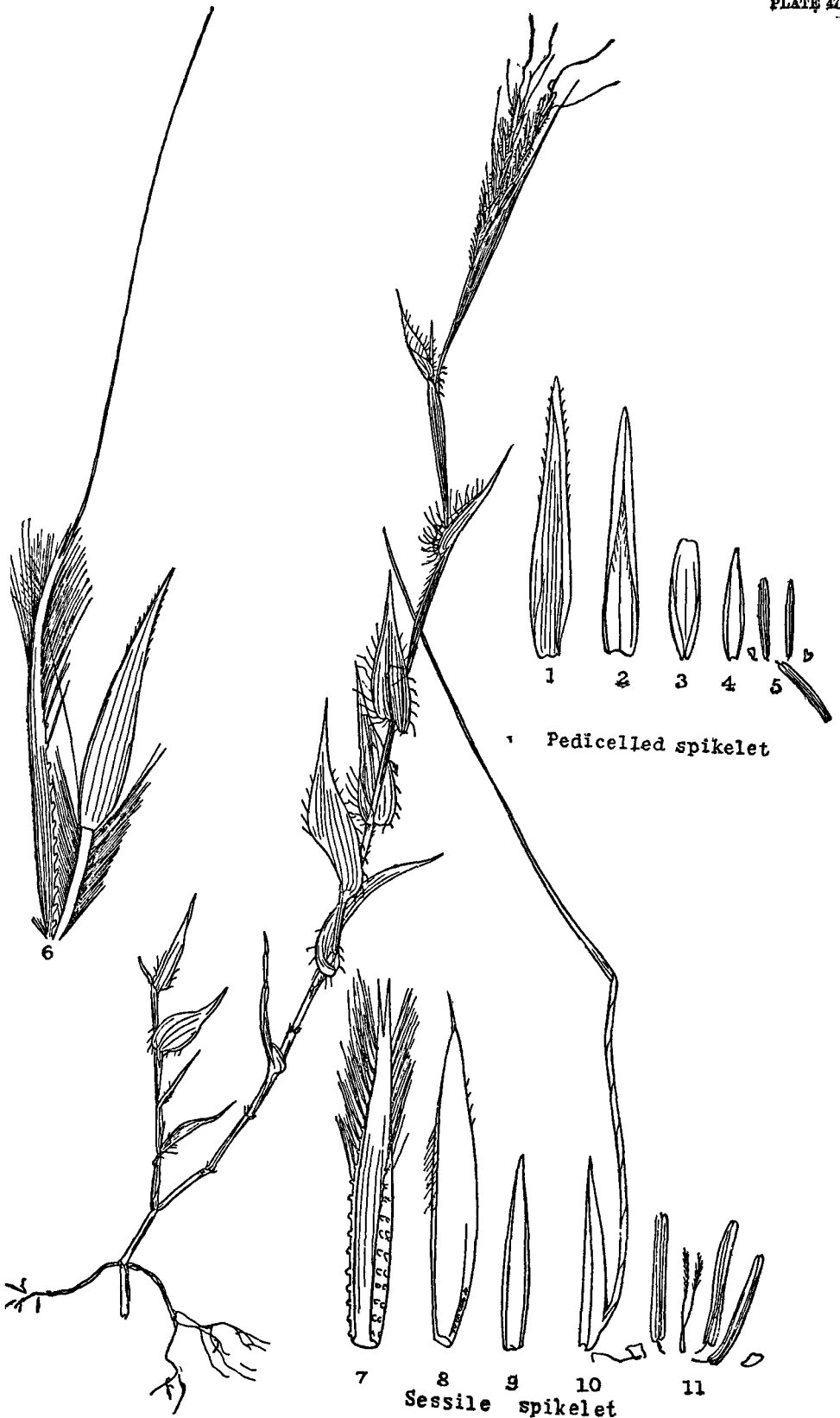
3. ARTHRAXON MEEBOLDII Stapf.

PLATE 47.

Arthraxon Meeboldii Stapf in Kew Bull. (1908) 449; Cooke Fl. Bomb II (1908) 969

Description : Annual, stems 2-3 from the base, shortly prostrate, ascending, 15-30 cm. long, slender, terete, quite glabrous, often tinged with purple, nodes pubescent. Leaves 2-5 by 0.6-2 cm., ovate lanceolate, finely acuminate, very sparsely hairy with slender bulbous-based hairs, green above, glaucous beneath, ciliate on the margins with bulbous-based hairs, base cordate, amplexicaul; sheaths of the lower leaves loose, the others close or the upper more or less tumid, at first enclosing the panicles, glabrous or with a few scattered hairs and more or less ciliate margins; ligule about 1.25 mm. long, quadrate, hyaline, shortly ciliate at the apex.

Inflorescence of paniculate racemes at the apex of the stems; branches 2-4, reaching 5 cm. long, joints of the rachis about 4 mm. long, densely clothed with long silvery hairs, pedicels 3 mm. long, broad. Sessile spikelets 6-10 mm. long, narrowly linear-lanceolate, callus minute, bearded. Glumes 4; lower involucral glume when young sometimes silky all over with a deciduous tomentum, linear-lanceolate, chartaceous, with a purplish 2-fid acumen with very narrow teeth and with incurved margins, keels serrately muricate from the base up to $\frac{2}{3}$ of their length, the murications passing into tubercles which in the upper third of the glume, are ciliate with fine erect silky hairs; upper involucral glume oblong-lanceolate, setosely acuminate, membranous, equalling the lower one, 3-nerved, with hyaline margins; lower floral glume empty elliptic-oblong, subobtuse, 4 mm. long, nerveless, upper floral glume linear-lanceolate, acute, rather more than 4 mm. long, hyaline, aristate from near the base, the awn 1.3 cm. long or more. Pedicellate spikelets closely appressed to the sessile ones, lanceolate, acute, chartaceous, shorter than the sessile spikelets; lower involucral glume with rigidly ciliate keels, otherwise glabrous, 9-nerved; upper involucral glume lanceolate, acute, 3-nerved; lower floral glume empty, ovate-oblong, hyaline, 4 mm. long; upper floral glume ovate, 2-dentate, equalling the lower, mucronulate between the teeth, hyaline, male. Anthers 3 mm. long, bright yellow.



ARTHRAXON MEEBOLDII STAFF.

Drawn: B. K. Bhide.



Sessile spikelet

ARTHRAXON LANCIFOLIUS HOCHST.

The development of the spikelet from its first appearance within the spathe to the mature condition shows a great amount of variation. The glumes are at first flat. Then as development progresses the margins of the lower involucre glume become inflexed. At first the entire spikelet is silky (silvery hairy), including the margins of the glumes, but with maturity the silky condition is lost. At this stage the murications are not properly developed and appear as short tubercles surmounted by thin translucent hairs, sometimes as many as 3 or 4, but in the mature state the murication is terminated by a single translucent hair. The condition of the tip of the hair too is very variable, not always being 2-toothed as described.

Locality : *W Ghats* - Khandala, common (McCann 9948 !, 9949 !), in open grass-land on hillside, 2,000 ft. (Meebold 9132), Lonavla, common (Bhide !, McCann !); Panchgani (Blatter & Hallberg B1225 ! 1238 !), Taleland (Blatter 3804 !), Mahabaleshwar (Sedgwick & Bell 4523 !).
N Kanara Tinai (Talbot 2569 !).

Distribution : W. Peninsula, apparently endemic.

Explanation of Plate 47 : *Arthraxon Meeboldii* Stapf.

- | | | |
|---|---|----------------------|
| 1. Lower invol. glume. | } | Pedicelled spikelet. |
| 2. Upper invol. glume | | |
| 3. Lower floral glume. | | |
| 4. Upper floral glume | | |
| 5. Stamens and lodicules. | | |
| 6. Pedicelled and sessile spikelets. | } | Sessile spikelet. |
| 7. Lower invol. glume | | |
| 8. Upper invol. glume. | | |
| 9. Lower floral glume. | | |
| 10. Upper floral glume. | | |
| 11. Stamens, ovary, styles and lodicules. | | |

4. *ARTHRAOXON LANCEIFOLIUS* Hochst

PLATE 48.

- Arthraxon lanceifolius* Hochst in Flora (1856) 188; Stapf in Fl. Trop. Afr. IX (1917) 165.
A. microphyllus Hochst in Flora (1856) 188, Hack. Monogr. Androp. (1889) 351, *incl. var. lanceifolius*, Hook f. Fl. Brit. Ind. VII (1896) 147; Cooke Fl. Bomb. II (1908) 970; Haines Bot. Bih. and Or. (1924) 1026.
A. Schmidtii Hochst. in Flora (1856) 189.
A. minor Hochst l. c. 188 (*partim*).
A. Schumperi Hochst. l. c. (*partim*).
A. molle Balf. f. Bot. Socotra (1888) 315.
A. ciliaris Henriq in Bolet. Soc. Brot. XIII, 133 (*non* Beauv.).
Andropogon lanceifolius Trin. in Mem. Acad. Petersb., 6 ser., II (1833) 271.
A. molle Duthie Grasses N W Ind. (1883) 17.
A. multicaulis Steud. Syn. Pl. Glum. I (1855) 383.
Batrachium molle Nees & Arn in Edinb. New Phil. Journ. XVIII (1835) 181, *Artchis*. Cat. Panj. Pl. 174.
B. Schumperi Nees ex Hochst. l. c. 179.
Periopogon Schumperi Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 447.
Pleuroplus ciliata J. Schmidt Beitr. Fl. Cap. Verd. (1852) 152.
P. Schumperi Regel in Bull. Acad. Petersb. X (1866) 369.
Lucaea ciliata Steud. l. c. 414.

Vernacular name : Faradyachne gavat.

Etymology : *Lanceifolius* indicates that the leaves are lance-shaped.

Description : Annual; stem and branches filiform, 15-30 cm long, straggling, glabrous or more or less obscurely pubescent below the spikes. Leaves 2-3.2 cm. by 4-8 mm., ovate or elliptic, acuminate, membranous, very sparingly hairy or nearly glabrous, base slightly auricled, margins naked or sparsely ciliate especially towards the base; sheaths short, glabrous; ligule small, hyaline.

Panicle of 3-5 slender branches; rachis capillary; internodes shorter than the slender spikelets, usually ciliate with long erect hairs (rarely glabrous). Spikelets solitary (rarely with a pedicellate one), 3 mm long, narrowly lanceolate; callus nearly glabrous. Glumes 4; lower involucre glume thinly membranous, lanceolate, 2-cuspidate, 5-7-nerved above the middle, the nerves usually scabrid, upper involucre glume as long as the lower, narrowly lanceolate, narrowing out into a very fine awn-like point 0.05-0.8 mm. long; lower floral glume much

shorter than the upper involucre glume, lanceolate, acuminate, epaleate; upper floral glume 1.25 mm. long, ovate-lanceolate, subacute, hyaline, with an awn about 1 cm. long from near the base, the column of the awn brown, much shorter than the usually purplish capillary subulate portion.

Locality : *Gujarat* : Surat (Herb. Dehra Dun !, Cooke !).

Konkan : Tunga Hill, Thana Dist. (Herb. Econ. Bot. Poona !); Parel (Herb. Econ. Bot. Poona !); Kurla (Garade !); Salsette (Jacquemont 713).

W. Ghats : Castle Rock (Bhide !).

Deccan : Trimbak, Nasik Dist. (Herb. St. X. C. Bombay !).

S. M. Country : Belgaum, Fort walls (Sedgwick 3012 !); W. of Dharwar, banks of road, in forest (Sedgwick 1851 !).

N. Kanara : Karwar (Talbot 1308 !); Yellapur (Talbot 2084 !).

Ecology : A plant growing sporadically. A xerophyte, often on walls.

Distribution : More or less throughout India, Ceylon to Tonkin and S. W. China, tropical Africa (Upper Guinea, Nileland).

Economic uses : Good fodder for cattle.

Explanation of Plate 48 : *Arthraxon lancifolius* Hochst.

- | | |
|-------------------------------|---------------------|
| 1. Spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume. | |
| 6. Stamens, ovary and stylea. | |

5. *ARTHRAOXON QUARTINIANUS* Nash.

PLATE 49.

Arthraxon quartinianus Nash in North Americ. Fl. XVII (1912) 99; Merrill in Philipp. Journ. Sc. Bot. VII (1912) 229; Stapf in Fl. Trop. Afr. IX (1917) 166.

A. major Hochst. in Flora (1856) 188.

A. coloratus Hochst. l. c.

A. plumbeus Hochst. l. c. 189.

A. violaceus Hochst. l. c.

A. Schumperi Hochst. l. c. (*partim*).

A. ciliaris Rendle in Cat. Afr. Pl. Welw. II, 138, (*non* Beauv.).

A. ciliaris, *subsp. quartinianus* Hack. Monogr. Androp. (1889) 356 (*excl. vars. Hookeri et glabrescens*).

Alectoridna quartiniana A. Rich. Tent. Fl. Abyss. II (1851) 448, t. 99.

Lucaea major Steud. Syn. Pl. Glum. I (1854) 414; Hochst. l. c. 179.

L. plumbea et violacea Steud. l. c.

L. Schumperi Hochst. in Flora (1856) 180 (the genuine).

Pleuroplutis plumbea Nees ex Steud. l. c.

P. violacea Nees ex Steud. l. c.

P. major Regel in Bull. Acad. Petersb. (1866) 369 (*partim*).

P. quartiniana Regel l. c. 376 (*partim*).

Andropogon violaceus Heyne ex Steud. l. c.

A. Alectoridna Steud. l. c. 383.

We wish to substitute *A. quartinianus* Nash in place of *A. ciliaris* Beauv. This latter species which was described in 1812 has been emended repeatedly since then, and that to such an extent that it is scarcely possible to recognise the original plant. Hackel made 5 subspecies: *Langsdorffii*, *submuticus*, *nudus*, *Quartinianus*, and *Vriesii*, and 9 varieties. The subspecies were arranged by him in two leading groups:

1. Joints of rachis glabrous, or with a few scattered hairs towards the tip (*Langsdorffii*, *submuticus*, *nudus*).

2. Joints of rachis, at least the upper, more or less ciliate (*Quartinianus*, *Vriesii*). To these two groups Hooker f. added a third one (F. B. I. VII, 146):

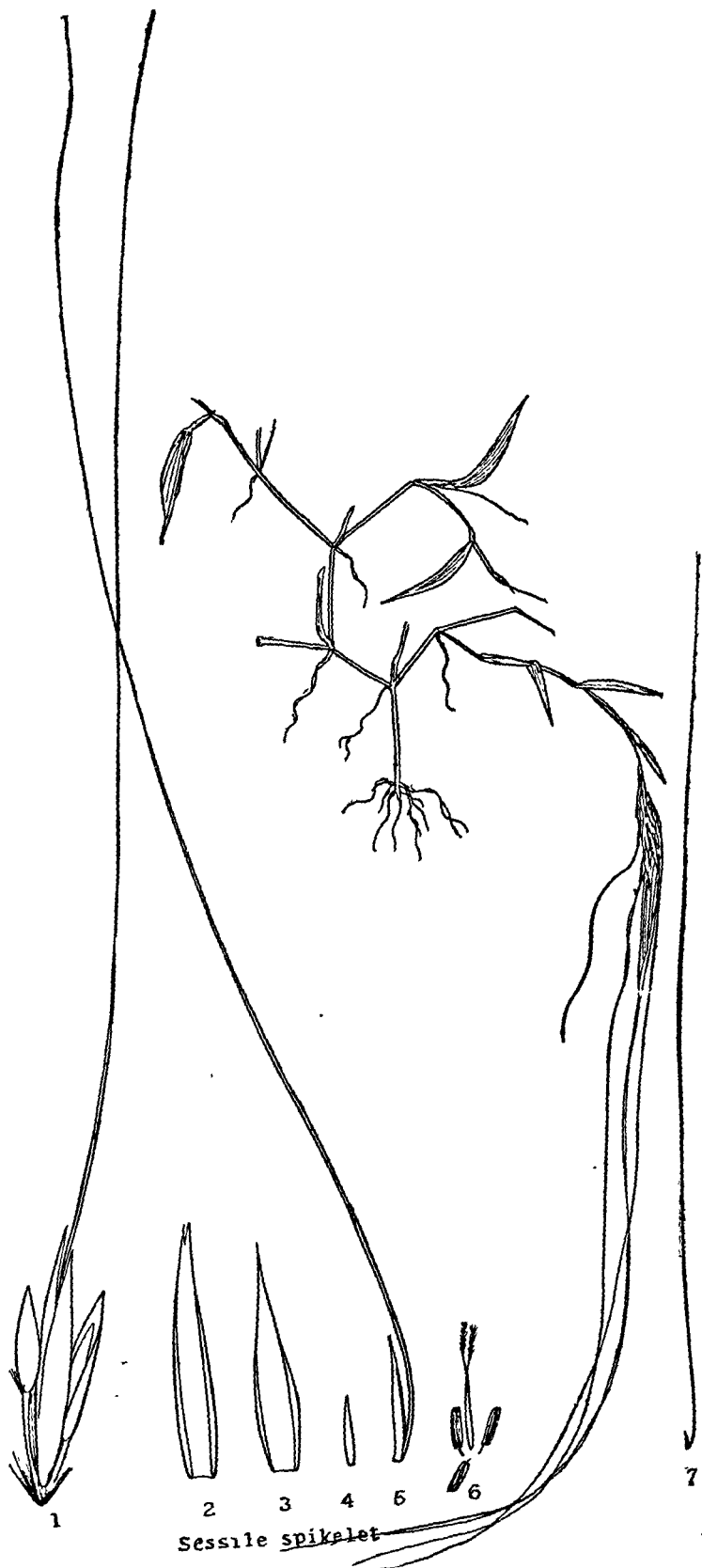
3. Spikes silkily villous, spikelets 5-7 mm. long, lower involucre glume entire or minutely 2-toothed, awn 12 mm. or more. (This is *Arthraxon cuspidatus* Hochst., considered by Hackel as a distinct species).

Arthraxon quartinianus Nash, and adopted by Stapf l. c., covers part of the subspecies *Quartinianus* in Hackel's group 2, including *var. Quartinianus s. str.* and *var. coloratus*, but excluding *var. Hookeri* and *var. glabrescens*. Quartin's specimen no. 14, collected in Abyssinia,



ARTHRAXON QUINARIANUS NASH.

Desm: B. K. Bhode.



Sessile spikelet

and representing a form with large spikelets, has, according to Stapf, to be considered as the basis of the species, whilst Schimper's 1532, the type of *Arthraxon coloratus*, stands for the other extreme.

Arthraxon quartinianus Nash includes all the material of the Bombay Presidency that has come under our observation.

The rest of *A. ciliaris* Beauv. et auctorum has to be studied separately, but as the material lies outside the Presidency we leave it to other botanists to work out their respective material.

Etymology : *Quartianus* after the French botanist Quartin.

Description : Annual. Stems very slender, ascending from a branched, sometimes prostrate and rooting base, from 8-30 cm. high, smooth, glabrous or finely puberulous below the inflorescence, with solitary or 2- to 3-nate branches above, internodes mostly exerted. Leaf-blades ovate-lanceolate to oblong-lanceolate from a cordate amplexicaul base, finely acuminate, 25 to over 50 mm. long by 5-20 mm. broad, flaccid, with scattered tubercle-based hairs on both sides, ciliate towards the base, primary lateral nerves 3-4 on each side, very fine; ligules membranous, ciliate, short, truncate; sheaths lax, the upper very often more or less inflated and bladeless, more or less hirsute in the upper part with tubercle-based hairs and densely ciliate along the upper margins, nodes shortly bearded.

Racemes 1 to about 9, in fascicles, born on filiform, ultimately long exerted peduncles, 2.5-15 cm. long, very slender, flexuous; rachis fragile; joints 3-3 mm. long, usually shortly ciliate, but the uppermost cilia sometimes up to 1.6 mm. long, sometimes glabrous or nearly so; pedicels reduced to a minute point or subule. Spikelets solitary, sessile, oblong lanceolate in profile, somewhat oblique, laterally compressed, including the very minute glabrous or minutely puberulous callus, 3.3-4.2 mm. long. Involucral glumes subequal, lower subchartaceous, acute, scaberulous along the very slender 7-9 nerves or almost smooth towards the base, upper obliquely lanceolate to linear-lanceolate in profile, acute or minutely mucronate, 3- (rarely 5-) nerved, eciliate. Lower floral glume oblong, obtuse, hyaline, obscurely 2-nerved, shorter by $\frac{1}{2}$ than the involucral glumes, upper narrowly linear-lanceolate in profile, 2.2-7 mm. long, awn from near the base, usually 6-3 mm. long, more rarely down to 4.2 or up to 8.5 mm. long, very delicate, kneeled and twisted below the middle. Stamens 2.

Locality : *Gujarat :* Chamargaon (Woodrow).

Khandesh : common (McCann!).

Konkan : very common (McCann!).

W. Ghats : Mahabaleshwar (Sedgwick & Bell 4501!); Panchgani (Blatter & Hallberg B1244! B1252! B1257! B1266! B1273! B1290!); Khandala, very common (McCann!).

S. M. Country : S. W. of Dharwar (Sedgwick & Bell 4434!); Dharwar (Sedgwick 3098!); Gadag (Talbot 2304!), Belgaum (Ritchie 796A).

N. Kanara : Halyal (Talbot 2161!), Yellapur (Talbot 1057!).

Ecology : A subgregarious species. Very abundant in the Mallad tract of the Carnatic. A xerophyte, often on walls. A very common species on the Ghats, on rocks, banks and walls. Very variable in size. Flowers in September.

Distribution : From Bihar southwards to Ceylon, tropical Africa (Nileland, Upper and Lower Guinea, Mozambique Dist.), introduced into Jamaica and Guadeloupe.

Explanation of Plate 49 : *Arthraxon quartinianus* Nash.

- | | |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | |
| 2. Lower invol. glume. | } Sessile spikelet. |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume. | |
| 6. Stamens, ovary and styles. | |

6. *ARTHRAAXON JUBATUS* Hack.

PLATE 50

Arthraxon jubatus Hack. Monogr. Androp. (1889) 358; Hook f. Fl. Brit. Ind. VII, 147; Cooke Fl. Bomb. II (1908) 970.

Etymology : *Jubatus* means having a mane or crest.

Description : Annual; stems decumbent, then ascending, 10-30 cm. long, very slender, terete, quite glabrous, leafy almost to the apex. Leaves 2.2-4.5 cm. by 4-8 mm., lanceolate, acute, flat, thinly membranous, green, undulate, densely pubescent or almost villous on both surfaces, base subcordate, amplexicaul; sheaths lax, pubescent, the upper spathiform, leafless; ligule very short, truncate, hyaline, glabrous. Floral spathe 3-8.5 cm. long, linear-lanceolate, acuminate, green with membranous margins, pubescent or villous, enclosing the spikes.

Racemes 2-nate, on a common peduncle, a sessile and a pedicellate one; the pedicel slender, pubescent, fragile; joints $\frac{1}{2}$ as long as the spikelets and pedicels of upper spikelet clavate, compressed, pectinately ciliate. Spikelets 2-nate, a sessile and a pedicellate one at each joint, and a terminal male. Sessile spikelets 1 cm. long, linear-lanceolate, callus 1.25 mm. long, bearded with hairs equalling itself. Glumes 4; lower involucre glume membranous, linear, acute, bimucronulate, 2-nerved, the margins hyaline, inflexed; upper involucre glume rather shorter than the lower, linear-lanceolate, mucronulate, much compressed, 1-nerved, with hyaline margins, lower floral glume 4 mm long, narrow, linear, subacute, hyaline, nerveless, glabrous, upper floral glume $\frac{1}{2}$ as long as the upper involucre glume, lanceolate, acute, glabrous, with a very long capillary awn reaching 15 cm (or more) long, attached at the base; palea 0. Anthers 1.25 mm long. Pedicellate spikelets 5 mm long, not awned.

Locality: *Konkan* (Law, Stocks).

W. Ghats. Kori Fort, 12 miles south of Lonavla (Woodrow), Khandala, dam rocks (Hallberg 9788!); Fitzgerald Ghat (McCann 3315! 3316!).

Deccan. Lohagad Fort, top (McCann 9789).

Ecology: Very common on perpendicular and overhanging rocks about $4\frac{1}{2}$ miles down the Fitzgerald Ghat Road from Mahabaleshwar. Flowers in the latter part of September. The whole plant is not the common grass-green but is of a coppery tint. It apparently requires plenty of water as it was observed only in wet situations.

Distribution: W. Peninsula, apparently endemic.

Explanation of Plate 50: *Arthraxon jubatus* Hack

- | | |
|---------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume. | |
| 6. Stamens, ovary and styles. | |
| 7. Upper floral glume (natural size). | |

31. CAPILLIPEDIUM Stapf.

Annual or perennial grasses. Stems slender, simple or branched, sometimes very copiously, often bearded at the nodes. Leaf-blade with a rather conspicuous white midrib.

Panicles delicate, when much divided the branchlets at length more or less divergent. Spikelets small, 2-nate, one sessile, the other pedicelled, similar in shape but differing in sex, in 1-2- (rarely up to 8-) jointed racemes at the ends of the capillary primary and secondary and often tertiary or even quaternary branches of a loose panicle; joints and pedicels finely filiform, longitudinally grooved and hyaline in the groove, disarticulating horizontally; sessile and pedicelled spikelets deciduous, the former with the adjacent joint and pedicel. Florets 2 in the sessile spikelet, lower reduced to an empty valve or quite suppressed in the pedicelled spikelets, upper hermaphrodite one, male or neuter, in the pedicelled spikelet. Sessile spikelet dorsally compressed, awned, callus small, shortly bearded. Involucre glumes equal, membranous to subherbaceous, lower 2-keeled, with narrow inflexed margins; upper boat-shaped, 3-nerved, keeled, grooved on both sides along the obtuse keel. Lower floral glume hyaline, nerveless, upper consisting of a hyaline, linear stipe, firmer upwards, passing into a slender awn. Palea 0. Lodicules 2, minute, glabrous. Stamens 3. Stigmas exerted laterally, longer than the styles. Grain oblong-ellipsoid or oblong, dorsally slightly compressed, embryo exceeding $\frac{1}{2}$ of the grain. Pedicelled spikelet awnless, glume, if present, hyaline, nerveless.

Species 6. Tropical and subtropical Asia, Polynesia and Australia, tropical Africa.

Three species, described by Cooke (II, 981, 982) under *Andropogon assimilis* Steud., *A. Hugelmii* Hack, and *A. filiculmis* Hook. f. belong to this genus

I. Stems more or less suffrutescent below, stiff, erect.

1. Nodes of stem glabrous or bearded, callus shortly bearded

2. Nodes of stem bearded; callus densely villous

1. *C. assimile*.

2. *C. Hugelmii*.

II. Stems decumbent and interlaced, very weak, filiform

3. *C. filiculmis*.

1. CAPILLIPEDIUM ASSIMILE A. Camus.

PLATE 51.

Capillipedium assimile A. Camus. Graminées in H. Lecomte Fl. Générale de l'Indo-Chine 7 (1922) 314, Haines Bot. Bih. and Or. (1924) 1028 (*A. Camus prus fecit combinationem novam*).



Sessile spikelet

CAPILLIPEDIUM ASSIMILE A. CAMUS.

Detm: B. K. Ehde.



CAPILLIPEDIUM HUGELII BLATTER & MENCH.

Deton: B. K. B

Andropogon assimilis Steud. in Zoll. Syst. Verz. (1854) 58; Syn. Pl. Glum. (1855) 397, Hook. f. Fl. Brit. Ind. VII (1896) 179, Cooke Fl. Bomb. II (1908) 981.

A. montianus Benth. Fl. Hongk. (1861) 423, non Roxb., excl. syn., Hack. Monogr. Androp. (1889) 490, excl. syn.

Chrysopogon pictus Hance in Ann. Sc. Nat. ser. 5, V (1866) 252.

C. glaucopsis Steud. Syn. Pl. Glum. I (1854) 397, Duthie Grasses N. W. Ind. (1883) 22

Raphis repens Nees ex Steud. l. c.

Etymology : *Capillipedum* is derived from *capillus*, hair, and *pedum*, having a foot, or in other words, provided with a capillary foot, perhaps referring to the slender stems or more likely to the branches of the delicate panicle.—*Assimile* means similar to something, but this something is not known to us.

Description : Suffrutescent, fastigiate branched from a decumbent base, stems 30-60 cm. long, hard, smooth and polished, as thick as a goose-quill at the base, often proliferously branched; nodes glabrous or bearded. Leaves 7.5-20 cm. by 2.5-6 mm., linear-lanceolate, finely acuminate, glabrous or nearly so, with a strong white midnerve; sheaths usually glabrous except at the mouth which is sometimes bearded, the upper sheaths appressed, the lower open, often divaricate, ligule short, membranous, ciliate.

Inflorescence in lax panicles, branches slender, almost capillary, with long hairs in the axils. Spikelets few, rather distant, pale green, joints 1.5 mm. long, with a translucent centre, sparsely ciliate. Sessile spikelets 2.5 mm. long, ovoid-oblong, callus small, shortly bearded; lower involucre glume 2.5 mm. long, ovoid-oblong, shortly truncate, obscurely 4-6-nerved, ciliate chiefly in the upper half, not pitted, upper involucre glume as long as the lower, lanceolate acute, lower floral glume shorter, linear, obtuse; upper floral glume reduced to the scarcely flattened base of the awn, 1-1.3 cm. long, the lower half brown, the upper yellowish white. Pedicellate spikelets 4 mm. long, not awned, pedicels 1.5 mm. long, sparsely ciliate, lower involucre glume lanceolate, acute, the margins incurved and the keels ciliate in the upper part, 5-7-nerved, upper involucre glume slightly shorter, lanceolate, 3-nerved; lower floral glume obovate-oblong, ciliate at the apex, hyaline, upper floral glume 0. Anthers 1.5 mm. long.

The old nodes alone are not bearded, but the young ones always are.

Locality : *Khandesh* : Toranmal, growing among *Strobilanthus* (McCann 9671!).

Konkan : Above Kanari Caves (McCann 9959!).

W. Ghats : In dry forest, between Mahabaleshwar and Panchgani, at 4,000 ft. (Sedgwick & Bell 4738!).

N. Kanara : Jugglepet, roadside, common (Talbot 1386!).

Ecology : This grass usually grows among other plants being supported by them when it reaches a very large size.

Distribution : Temperate Himalaya, Khasia, Bihar, N. Bengal, Rajputana, Central India, W. Peninsula, Java, China, Japan.

Explanation of Plate 51 : *Capillipedum assimile* A. Camus.

- | | |
|-------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets | } Sessile spikelet. |
| 2. Lower invol. glume | |
| 3. Upper invol. glume | |
| 4. Lower floral glume. | |
| 5. Upper floral glume. | |

2. CAPILLIPEDIUM HUGELII Blatter & McCann.

PLATE 52

Capillipedum Hugelii Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 420.

Andropogon Hugelii Hack. Monogr. Androp. (1889) 492, Hook. f. Fl. Brit. Ind. VII (1896) 180, Cooke Fl. Bomb. II (1908) 982.

Etymology : *Hugelii*, after Baron C. Huegel a botanical traveller in India about the middle of the last century.

Description : Stem often suffrutescent below, frequently red, branching from the base, the branches 75-105 cm. long; nodes bearded. Leaves 10-20 by 2-1.3 cm., linear-lanceolate, acuminate, flat, flaccid, green, narrowed to the base, the margins scaberulous or sometimes ciliate, sheaths bearded at the mouth, otherwise glabrous; ligule membranous, ciliate.

Panicle 5-9 cm. long; branches capillary with bearded axils, joints and pedicels ciliate. Sessile spikelets 3 mm. long, pale green or purplish; callus densely villous; lower involucre glume chartaceous, ovate, truncate, villous below the middle or glabrous, margins narrowly incurved, the keels ciliate with long hairs, upper involucre glume as long as the lower,

glabrous, narrowly truncate, shortly apiculate, lower floral glume 1.5 mm. long, hyaline, ovate, obtuse, glabrous, upper floral glume represented by the slender white not dilated base of the awn; awn reaching nearly 2.5 cm. long. Pedicellate spikelets 4 mm. long, lanceolate, green or purple, lower involucre glume subacute, 9-11-nerved, pubescent up the back and with ciliate keels, upper involucre glume as long as the lower, acuminate, the keels minutely ciliate; lower floral glume oblong, obtuse, hyaline, nearly as long as the upper involucre glume, nerveless upper floral glume narrowly linear or 0.

The panicle soon crumbles to pieces after being pressed.

Locality : *Khandesh* : Toranmal (McCann 9672 !)

Konkan : Mulgaun (McCann 3664 !).

W. Ghats : Khandala, St. Xavier's Villa (McCann 9423 !), dry forests between Mahabaleshwar and Panchgani (Sedgwick 4738 !); Panchgani (Blatter & Hallberg B1321 !, McCann !).

S. M. Country : Deciduous forests west of Dharwar (Sedgwick 4498 !).

N. Kanara : Halyal (Talbot 2082 !), Eombi to Mungod (Hallberg & McCann A288 !).

Ecology : This grass is frequently rooting at the nodes

Distribution : Rajputana, Central Provinces, Central India, W. Peninsula.

Explanation of Plate 52 : *Capillipedium Hugellii* Blatter & McCann.

- | | |
|---|---------------------|
| 1. Pedicelled and sessile spikelet. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume | |
| 5. Upper floral glume. | |
| 6. Stamens, ovary, styles and lodicules | |

3. CAPILLIPEDIUM FILICULME Blatter & McCann

Capillipedium filiculme Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 420.

Andropogon filiculme Hook. f. Fl. Brit. Ind. VII (1896) 181, Cooke Fl. Bomb. II (1908) 982.

Etymology : *Filiculme* is derived from *filum*, a thread, and *culmus*, a stem, referring to the very thin stem.

Description : Stems 60-90 cm. long, decumbent and interlaced, copiously geniculate branched, weak, filiform, quite glabrous, internodes long, nodes bearded. Leaves 5-10 cm. by 3-4 mm., linear-lanceolate, finely acuminate with a filiform tip, glabrous above, glabrous or sparsely hairy beneath, flaccid, suddenly narrowed at the base, pale green, the midrib and nerves slender, sheaths bearded at the very tip, otherwise glabrous, the lower sheaths open below, ligule membranous, ciliate.

Panicles 2.5-5 cm. long, branches few, filiform. Spikelets 2 or 3, pale green or white; pedicels of upper spikelets ciliate with long hairs. Sessile spikelets 3 mm. long, oblong-lanceolate, callus densely villous, lower involucre glume oblong-lanceolate, obtuse, membranous, 5-7-nerved, villous below the middle or all over, the keels ciliate, upper involucre glume thinly membranous, lanceolate, acute, shortly mucronate, 3-nerved, glabrous; lower floral glume small, ovate, obtuse, nerveless, hyaline, upper floral glume represented by an awn 13-16 mm. long, the lower half dark brown, the upper half yellowish white, the base not dilated, white for about 2 mm. Pedicellate spikelets as long as the sessile but narrower, lower involucre glume ovate-lanceolate, acute, 7-9-nerved, ciliate, upper involucre glume lanceolate, strongly 5-nerved; lower floral glume broadly oblong, obtuse, hyaline, nerveless, as long as the involucre glumes; upper floral glume 0.

Locality : *Konkan* : Trombay (McCann A286 !).

W. Ghats : Khandala to Karjat (Blatter & Hallberg A287 !), Igatpuri (Blatter & Hallberg 5117 !).

Deccan : Poona, in rocky places (Jacquemont 310); Donshi, Mawal Dist. (Woodrow 26); Purandhar (McCann 5570 !).

S. M. Country : Forests near Dharwar (Sedgwick 1854 !)

Ecology : A weak grass with long stilt roots from the lower side of the nodes.

Distribution : W. Peninsula, apparently endemic.

32. AMPHILOPHIS Nash

Perennial grasses. Stems slender, simple or branched, bearded or beardless at the nodes.

Panicles mostly subdigitate with a short primary axis, rarely the racemes on branches of the second order, racemes always shortly peduncled. Spikelets small, 2-nate, one sessile, the other pedicelled, similar in shape or the pedicelled reduced and smaller, the latter always

different in sex except sometimes the lowermost pair which may be homogamous (male or neuter), on the fragile rhachis of many-jointed shortly peduncled racemes, joints and pedicels filiform longitudinally grooved and hyaline in the groove, disarticulating horizontally, sessile and pedicelled (always ?) spikelets deciduous, the former with the adjacent joint and pedicel. Florets 2 in the sessile spikelets, lower reduced to an empty glume, upper hermaphrodite, 2 or 1 in the pedicelled spikelet, the lower male or neuter, the upper neuter or usually quite suppressed. Sessile spikelet dorsally compressed, awned, callus small, shortly bearded. Involucral glumes equal, thinly chartaceous to membranous, lower 2-keeled, with narrow sharply inflexed margins, upper boat-shaped, 3-nerved, acutely keeled. Lower floral glume hyaline, nerveless, upper a hyaline linear stipe, firmer upwards, passing into a slender awn. Paleae 0 or very minute. Lodicules 2, minute, glabrous. Stamens 3. Stigmas exerted laterally usually low down, longer than the styles. Grain oblong, obtuse, dorsally slightly compressed; embryo about half the length of the grain. Pedicelled spikelet awnless, glumes, if present, hyaline, nerveless.

Species probably over 25—Mostly in tropical Asia.

Cooke (II, 977-981) mentions 8 species which belong to the section *Amphilophis* of *Andropogon*—*Andropogon compressus* Hook. f., *A. Woodrowii* Hook. f., *A. pertusus* Willd., *A. Kuntzeanus* Hack., *A. ensiformis* Hook. f., *A. concanensis* Hook. f., *A. intermedius* Cooke (non R. Br.); *A. odoratus* Dna Lisboa. All these are now being transferred to the new genus *Amphilophis* Nash.

A. Racemes digitate or fasciculate, the lower longer than the rhachis of the inflorescence.

I. Lower involucral glume of sessile spikelets villous below the middle.

1. Lower involucral glume not pitted

a. Upper involucral glume mucronulate . . . 1 *A. compressa*.
b. Upper involucral glume obtuse . . . 2 *A. Woodrowii*.

2. Lower involucral glume pitted . . . 3. *A. pertusa*.

II. Lower involucral glume of sessile spikelets glabrous below the middle (sparsely silky in *A. ensiformis*).

1. Nodes of stem densely bearded . . . 4. *A. Kuntzeana*.

2. Nodes of stem glabrous

a. Leaves reaching 12 mm. broad . . . 5. *A. ensiformis*.
b. Leaves reaching 3 mm. broad . . . 6. *A. concanensis*.

B. Racemes panicle, the lower branches shorter than the rhachis of the inflorescence

I. Non-aromatic; sheaths terete . . . 7. *A. glabra*.

II Aromatic, sheaths compressed . . . 8. *A. odorata*.

1. AMPHILOPHIS COMPRESSA Blatter & McCann.

PLATE 53

Amphilophis compressa Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 421.

Andropogon compressus Hook. f. Fl. Brit. Ind. VII (1896) 172, Cooke Fl. Bomb. II (1908) 977.

Etymology: *Compressa*, alluding to the compressed stem.

Description: A tall grass reaching 0.9-1.2 m. high, stem as thick as a goose-quill at the base, erect, sparingly branched, leafy, nodes glabrous. Leaves 30-45 cm. by 6-10 mm., linear finely acuminate, flat, slightly scaberrulous on both surfaces and on the margins, more or less hairy towards the base; sheaths strongly compressed and acutely keeled; ligule a glabrous membrane 2.5 mm. long.

Panicles 10-12.5 cm. long, of many subcorymbosely arranged pale flexuous silky racemes 2.5-5 cm. long, joint 2.5 mm. long, slender, with a central translucent line, ciliate on 2 opposite sides with long silky hairs. Sessile spikelets 5 mm. long, ovate-lanceolate, callus bearded with long hairs, lower involucral glume ovate-lanceolate, 5 mm. long, villous on the back below the middle, truncate or notched at the apex, with narrowly incurved margins and a hyaline tip, 5-7-nerved, not pitted, upper involucral glume ovate, acute, mucronulate, as long as the lower; lower floral glume 4 mm. long, linear-lanceolate, obtuse, hyaline, nerveless, upper floral glume represented by an awn reaching 16 mm. long, inconspicuously margined for 2.5 mm. at the base. Pedicellate spikelets pedicels 3 mm. long, ciliate on 2 opposite sides with long silky hairs, very slender and with a central translucent line, lower involucral glume 9-11-nerved; upper involucral glume 3-nerved; lower floral glume oblong, obtuse, ciliate, hyaline, nerveless.

Locality : *W. Ghats :* Khandala, plain behind the Saddle (Hallberg 9657 l, Bhude l); Lonavla (McCann 9433 l).

Deccan Mawal (Woodrow l), Poona (Woodrow).

Ecology : This grass is strongly aromatic.

Distribution : W. Peninsula, apparently endemic.

Explanation of Plate 53 : *Amphilophis compressa* Blatter & McCann.

- | | | |
|---|---|----------------------|
| 1. Lower invol glume. | } | Sessile spikelet. |
| 2. Upper invol glume. | | |
| 3. Lower floral glume. | | |
| 4. Filaments, ovary, styles and lodicules | | |
| 5. Upper floral glume | | |
| 6. Pedicelled and sessile spikelets. | | |
| 7. Lower invol. glume. | } | Pedicelled spikelet. |
| 8. Upper invol glume. | | |
| 9. Lower floral glume. | | |
| 10. Upper floral glume. | | |
| 11. Stamens and lodicules | | |
| 12. Ligule | | |

2. AMPHILOPHIS WOODROWII A Camus

Amphilophis Woodrowii A. Camus in Rev. Bot. Appliq et d'Agricult colon I (1921) 305.

Andropogon Woodrowii Hook. f. Fl. Brit. Ind. VII (1896) 173, Lisboa Bomb Grasses (1896) 65, Cooke Fl. Bomb. II (1908) 978.

Etymology : Woodrow, a horticulturist and professor of Botany at the former Science College, Poona

Description : Rootstock woody, stems tufted, 0.9-1.2 m. long, erect, compressed, thicker than a goose-quill at the base, obtusely 2-edged, solid, stiff, branched above; nodes glabrous. Leaves 30-60 cm. by 3-4 mm., rigid, scaberulous on both surfaces and the margins; sheaths loose, keeled, quite smooth, ligule 2.5 mm. long, membranous, truncate, ciliate

Racemes 3-5, pale, 1.3-2.5 cm. long, on slender, stiff, smooth proper peduncles 3-13 mm. long, erect, silky; joints of the rachis and the pedicels linear, with silky margins and a translucent centre, the hairs at the top half as long as the spikelet. Sessile spikelets 4 mm. long, oblong-lanceolate; callus 0.8 mm. long, bearded; lower involucre glume coriaceous, not pitted, ovate-oblong, truncate and hyaline-tipped at the apex, many-nerved, margins narrowly incurved, keels ciliate, upper involucre glume chartaceous, 3-nerved, oblong, subobtusate, as long as the lower; lower floral glume 3 mm. long, ovate-oblong, obtuse, hyaline, nerveless; upper floral glume reduced to an awn 16 mm. long with a hyaline flattened base 2.5 mm. long. Pedicellate spikelets rather narrower than the sessile, lower involucre glume glabrous on the back; upper involucre glume narrow, linear, acute; awn 0.

Locality : *Deccan* . Khorbasa, Mawal Districts (Woodrow); Pand, 20 miles W. of Poona (Woodrow l).

Distribution : W. Peninsula, apparently endemic.

3. AMPHILOPHIS PERTUSA Stapf.

PLATE 54.

Amphilophis pertusa Stapf in Fl. Trop. Afr. IX (1917) 175; Haines Bot. Bih. and Or. (1924) 1030

Holcus pertusus Linn. Mant. Alt. (1771) 301.

Andropogon pertusus Willd. Sp. Pl. IV, 922, Beauv. Agrost. (1812) 131, t. 23, fig. 2; Roxb.

Fl. Ind. I (1832) 258, Hack. Monogr. Androp. (1889) 479 (vars. *genuinus* et *Wightii*);

Duthie Grasses N. W. Ind. (1883) 21 (excl. syn.), Fodder Grasses N. Ind. (1888) 38, t. 25;

Boiss. Fl. Or. V (1887) 464, Balf. f. Bot. Socotra (1888) 316, Hook. f. Fl. Brit. Ind. VII

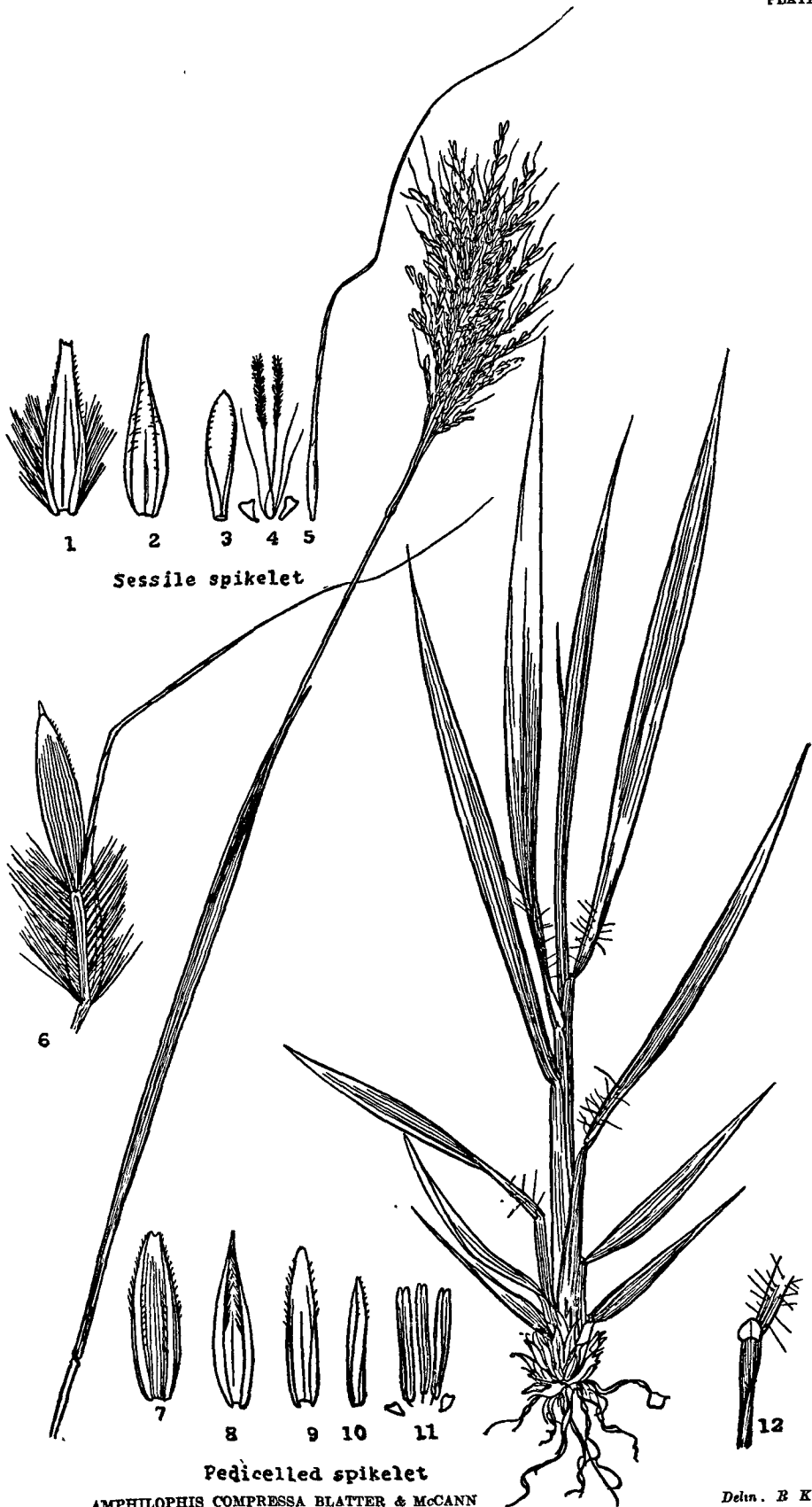
(1896) 173, Cooke Fl. Bomb. II (1908) 978.

Leptocercus pertusa Nees ex Steud. Syn. Pl. Glum. I (1855) 364

Vernacular names : Ghanga, Marvel, Payen, Palva, Palvan.

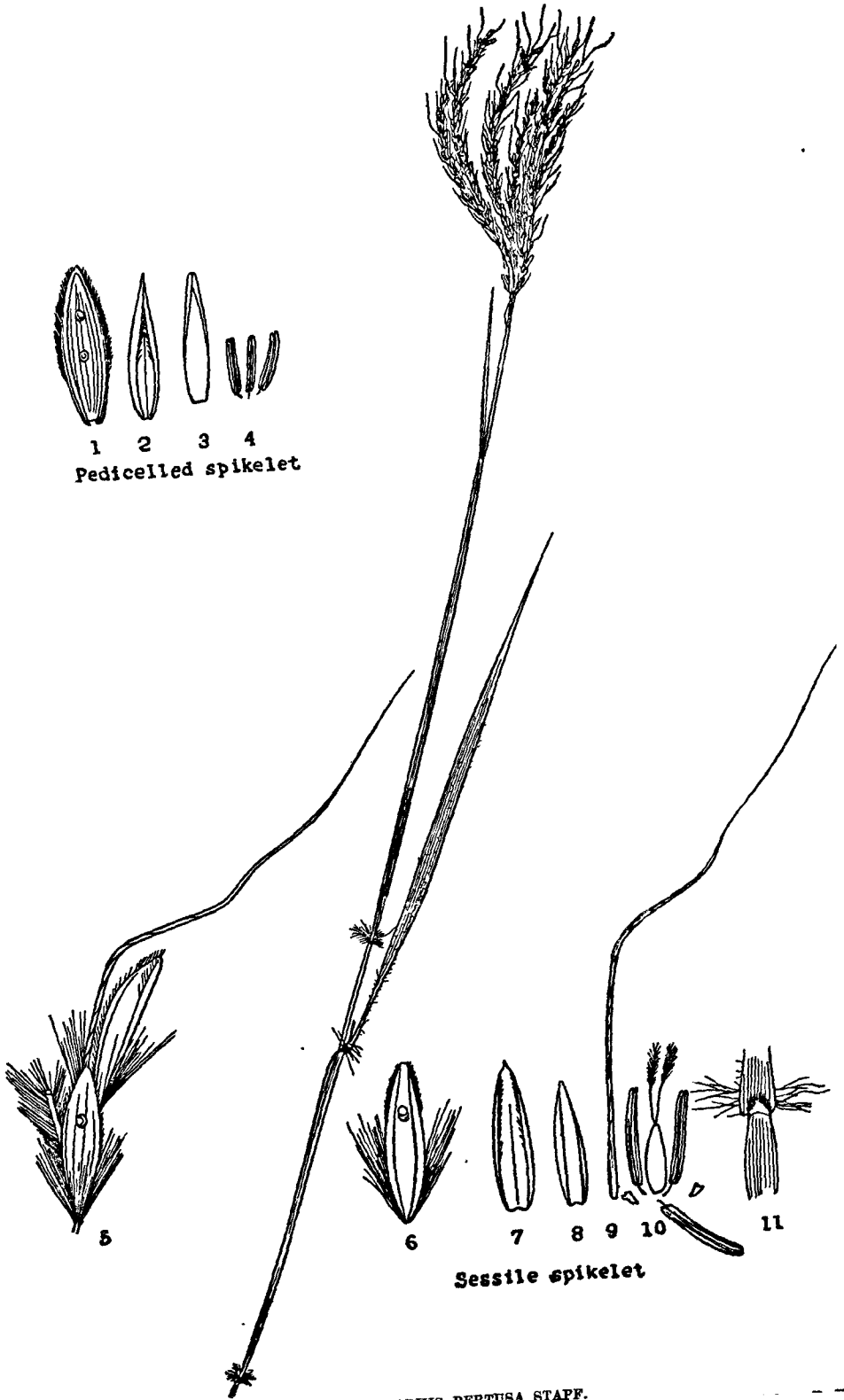
Etymology : *Pertusus* means perforated, having slits or holes, alluding to the lower involucre glume of the sessile spikelets which has 1 or 2 deep pits.

Description : Stem 30-60 cm. long, erect or geniculate ascending, leafy upwards, simple or sparingly branched; nodes bearded with spreading hairs. Leaves up to 30 cm. by 3-4



AMPHILOPHIS COMPRESSA BLATTER & McCANN

Delin. B. K. Bhude.



AMPHILOPHUS PERTUSA STAFF.

mm., narrowly linear, acute or acuminate, the lower often short and crowded at the base of the stem, glabrous or pubescent, or sometimes sparingly pilose, margins scabrid, base narrow, rounded, sheaths terete or slightly compressed, shorter than the internodes, ligule 2.5 mm. long, membranous, truncate, ciliate.

Racemes 3-8, digitately fasciculate, 2.5-5 cm long, slender, silky, suberect, flexuous, on short usually glabrous peduncles which are often bearded in the axils; rachis very slender; joints and pedicels 2-5 mm. long, densely ciliate with long silky hairs, the central translucent band very narrow. Sessile spikelets 4 mm long, oblong-lanceolate, acuminate by the projection of the point of the upper involucre glume, callus bearded; lower involucre glume elliptic-oblong, obtuse or truncate, sometimes slightly emarginate, with a deep pit above the middle (sometimes 2 pits when one is above, the other at or about the middle), subchartaceous, more or less hairy below the middle, 5-9-nerved, margins narrowly incurved, spinulose ciliate; upper involucre glume lanceolate, acuminate, finely pointed at the tip, the point slightly projecting beyond the lower glume, 3-5-nerved, membranous, glabrous, lower floral glume 2.5 mm long, linear-oblong, obtuse, nerveless, glabrous; upper floral glume reduced to a slender awn reaching nearly 2 cm. long, geniculate about the middle, the lower half brown, the upper yellowish white, with a narrow linear hyaline flattened base 2 mm long which represents the glume; palea 0. Pedicellate spikelets like the sessile but narrower, not awned; lower involucre glume acute, very rarely pitted, 7-13-nerved, ciliate, upper involucre glume ovate-lanceolate, acute, 5-nerved, with incurved margins; lower floral glume linear-oblong, obtuse, hyaline, glabrous.

A very variable plant We must confess we find it impossible to follow various authors, who have described a number of varieties It would be easy to increase their number on merely morphological grounds, but the results would be highly unsatisfactory. It is only from genetical tests that we can expect to get an insight into the natural variations of this and other species of this genus

Locality : *Gujarat* Daman (Bhide !); Perim Isl, Gulf of Cambay (Blatter 3814 !).

Konkan Bombay, St Xavier's College, compound (McCann 9630 ! 9631 !)
Khandala, Campoli (McCann 9961 !)

W. Ghats Lonavla (Woodrow), Panchgam (Blatter & Hallberg B1236 !)
on edge of Tableland (Blatter 9962 !), on roadside, 4,000 ft (Sedgwick & Bell 4699 !).

Deccan Nasik (Bourke 11 !), Rahun (Nana A278 !); Pashan (Gammie !);
Kirkee, Agricultural College (Bhide !), Poona (Cooke); Satara (Lisboa); Sholapur (Lisboa);
Joonur (Talbot !)

S. M. Country W of Dharwar, 2,000 ft, rainfall 35 in. (Sedgwick & Bell 4494 !); Dharwar, 2,400 ft, rainfall 34 in (Sedgwick & Bell 4488 !), Kunur, 2,000 ft, rainfall 35 in. (Sedgwick & Bell 4953 !), Badami (Talbot 2944 !), Haveri (Talbot 2233 !), Gokak (Sheodye !).

N. Kanara : Halyal (Talbot 2080 ! 2106 !)

Ecology : A sporadic grass Very abundant in the Carnatic. According to Lisboa the inflorescence is scented.

Distribution : More or less throughout India, chiefly in the drier parts, Ceylon, Afghanistan, Arabia, tropical Africa (Upper Guinea, Nileland, Mozambique District).

Economic uses : "This grass .. is universally esteemed as a good fodder grass, both for grazing and stacking. In Australia also it is highly valued, being regarded as one of the best grasses to stand long droughts, while it will bear any amount of feeding. It is useful also as a winter grass, if the weather is not too severe." (Duthie)

See also W Burns, L B Kulkarni and S. R. Godbole · A Study of some Indian grasses and grasslands Mem. Dept. Agr. in India XIV (1925) 47, 48

Explanation of Plate 54 : *Amphilophus pertusa* Stapf.

- | | | |
|---|---|----------------------|
| 1. Lower invol. glume. | } | Pedicelled spikelet. |
| 2. Upper invol glume | | |
| 3. Lower floral glume. | | |
| 4. Stamens | | |
| 5. Pedicelled and sessile spikelets. | } | Sessile spikelet. |
| 6. Lower invol. glume | | |
| 7. Upper invol. glume. | | |
| 8. Lower floral glume | | |
| 9. Upper floral glume. | | |
| 10. Stamens, ovary, styles and lodicules. | | |
| 11. Ligule. | | |

4. AMPHILOPHIS KUNTZEANA Haines.

PLATE 55.

Amphilophis Kuntzeana Haines Bot. Bih and Or. (1924) 1031.

Andropogon Kuntzeanus Hack. Monogr. Androp. (1889) 478; Hook. f. Fl. Brit. Ind. VII (1896) 175; Cooke Fl. Bomb. II (1908) 979.

Etymology : *Kuntzeana* after C. E. O. Kuntze, a botanical writer of the second half of the last century

Description : A tall grass 0.9-1.5 m high; stems ascending, as thick as a goose-quill below, with 2-3 slender flowering branches above, terete, small; nodes densely bearded. Leaves narrowly linear, 30 cm. by 3-8 mm, glabrous, glaucous, smooth, with scaberulous margins, the upper cauline leaves short, rigid.

Racemes 12-15, corymbosely fasciculate, slender, silky, purplish, proper peduncles 4-8 mm. long, slender, glabrous; joints and pedicels 2.5 mm. long, with a translucent centre, slender, densely ciliate with very long erect hairs. Sessile spikelets 5 mm. long, linear-lanceolate; callus sparsely bearded at the base with very long hairs, lower involucre glume ovate-lanceolate, thin, glabrous, usually pitted, 7-9-nerved, 2-toothed at the apex, the teeth about 1.2 mm. long, upper involucre glume as long as the lower, lanceolate, acuminate, mucronate, ciliate, lower floral glume 4 mm. long, linear-lanceolate, glabrous, hyaline; awn 16 mm. long, the basal slightly flattened portion 2.5 mm. long. Pedicellate spikelets narrower than the sessile male; lower involucre glume 9-11-nerved, tip entire; upper involucre glume 5-nerved, conspicuously ciliate; lower floral glume linear-oblong, hyaline, ciliate; upper floral glume small, narrowly linear or 0.

Locality : Konkan (Stocks).

Deccan (Woodrow 153 !), Mawal (Woodrow).

Distribution : Bihar, Central Provinces, W. Peninsula.

Explanation of Plate 55 : *Amphilophis Kuntzeana* Haines.

- | | |
|---|---------------------|
| 1. Ligule. | |
| 2. Pedicelled and sessile spikelet and joint of rachis. | |
| 3. Lower invol. glume. | } Sessile spikelet. |
| 4. Upper invol. glume. | |
| 5. Lower floral glume. | |
| 6. Stamens, ovary and style. | |
| 7. Upper floral glume. | |

5 AMPHILOPHIS ENSIFORMIS Blatter & McCann.

Amphilophis ensiformis Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 422.

Andropogon ensiformis Hook. f. Fl. Brit. Ind. VII (1896) 175, Cooke Fl. Bomb. II (1908) 979.

Etymology : *Ensiformis* means sword-shaped, referring to the strict, rigid, linear-lanceolate leaves

Description : Stems 60 cm. and upwards, densely tufted, stout, compressed, clothed with equitant leaf-sheaths, nodes glabrous. Leaves 20-25 cm. by 8-13 mm., erect, strict, rigid, linear-lanceolate, acuminate, strongly nerved, glabrous or sparsely hairy, tips acicular, margins, and both surfaces scaberulous, sheaths smooth, compressed, the lower equitant; ligule short, scarious.

Racemes 13-17 mm. long, in an erect narrow thyrsus 7.5 cm. long, pale purplish, proper peduncles 4-6 mm. long, joints and pedicels 2.5 mm. long, very slender, flat, with a translucent channel, ciliate with long erect hairs. Sessile spikelets 5 mm. long, oblong-lanceolate, acute; callus small, densely bearded with hairs nearly $\frac{1}{2}$ as long as the spikelet; lower involucre glume 4 mm. long, ovate-oblong, flat, truncate, often emarginate, shining, 5-7-nerved, not pitted, very sparsely silky-hairy below the middle, margins very narrowly incurved, keels slender, upper involucre glume reaching 5 mm. long, ovate-oblong, acute, finely mucronate, slightly exceeding the lower, 3-nerved, lower floral glume less than 4 mm. long, linear-oblong, acute, hyaline; upper floral glume reduced to an awn reaching 2.2 cm. long, the flattened slightly dilated base 1.5 mm. long representing the glume. Pedicellate spikelets as long as the sessile, oblong-lanceolate; lower involucre glume many-nerved, upper involucre glume 5-nerved; lower floral glume as long as the sessile; upper floral glume 0.

Locality : W. Ghats : Lonavla (Woodrow !).

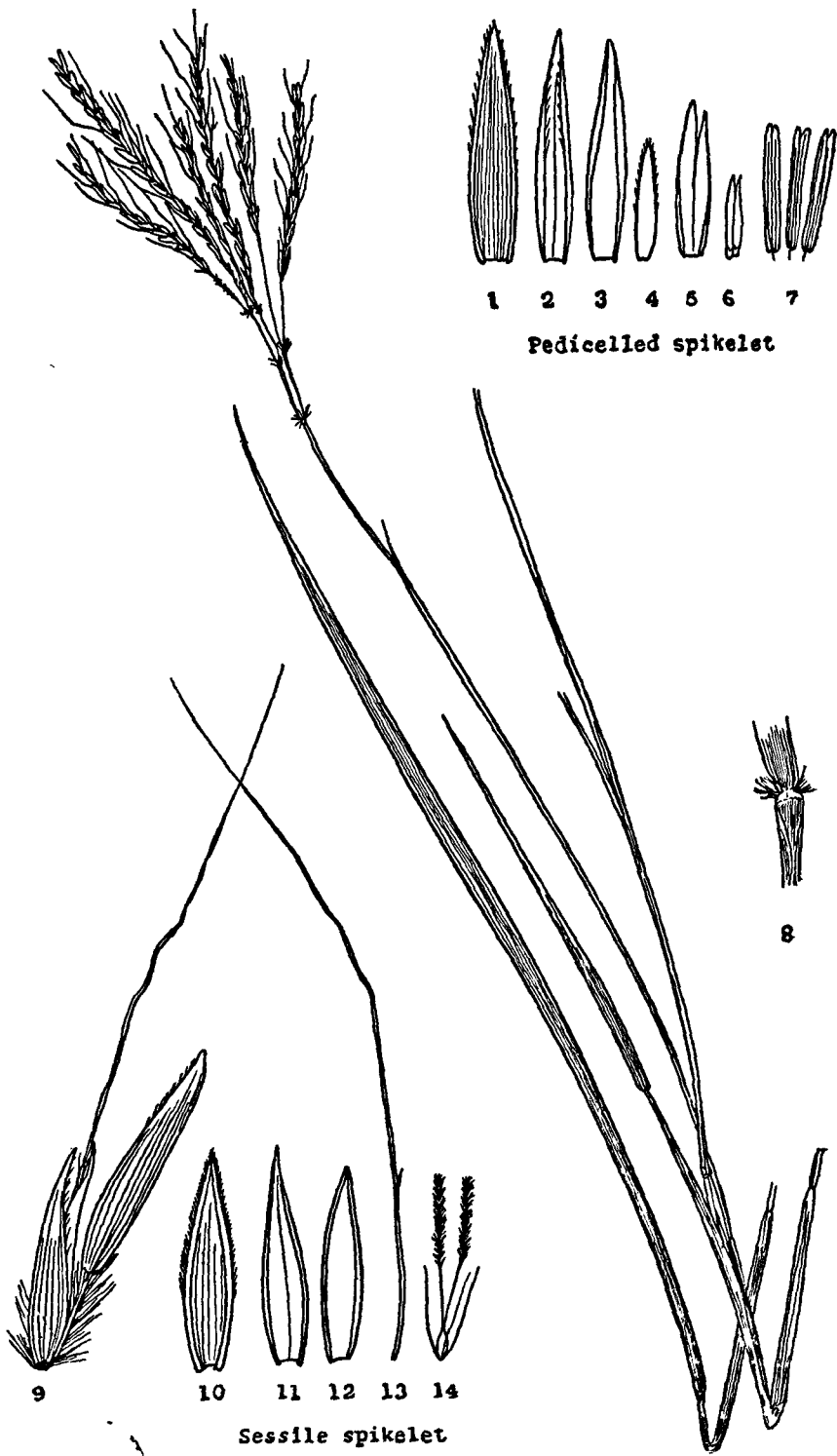
Distribution : W. Peninsula, apparently endemic.



Sessile spikelet

AMPHILOPHIS KUNTZEANA HAINES

Dehn: R. K. Bhide.



AMPHILOPHIS CONCANENSIS BLATTER & McJANN

Drawn : B. K. Bhu

6. *AMPHILOPHIS CONCANENSIS* Blatter & McCann.

PLATE 56.

Amphilophis concanensis Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 422.

Andropogon concanensis Hook. f. Fl. Brit. Ind. VII (1896) 174; Cooke Fl. Bomb. II (1908) 980.

Description : Perennial; stems many from a nodose rootstock, 50-60 cm. high, firm, smooth, terete, leafy; nodes glabrous. Leaves 20-25 cm. by 2-3 mm., linear, finely acuminate, smooth on both surfaces; sheaths smooth, terete; ligule short, membranous, truncate, glabrous.

Racemes 5-8, loosely fasciculate, 5-7 cm. long, slender, flexuous, pale; rachis and proper peduncles filiform, glabrous, the latter 13-20 mm. long, with slightly bearded axils; joints and pedicels 2 mm. long, compressed, hardly grooved and not translucent in the centre, the sides not thickened, ciliate with long silky hairs. Sessile spikelets less than 4 mm. long, ovate-lanceolate, narrowly truncate, callus bearded; lower involucre glume membranous, with incurved margins, glabrous, not pitted on the back, keels ciliate with short bristles, 7-9-nerved; upper involucre glume as long as the lower, lanceolate, acuminate, ending in a fine point which just appears above the tip of the lower glume, faintly 3-nerved, lower floral glume much shorter than others, oblong, obtuse, nerveless; upper floral glume a capillary yellowish awn reaching 2 cm. long with a slightly dilated base 2.5 mm. long. Pedicellate spikelets narrower than the sessile, lower involucre glume 9-nerved; upper involucre and lower floral glume as in the sessile spikelets, upper floral glume small, oblong, often unequally 2-fid, ciliate, nerveless.

Locality : W. Ghats: Matheran (Woodrow !); Yenna River, Lingmala, Mahabaleshwar, 4,000 ft., rainfall 200 in. (Sedgwick & Bell 4652 !); Lingmala, Mahabaleshwar (Blatter & Hallberg B1328 !); Khandala, in watercourses, common (McCann 9651 !).

Decan : Manmad, river-bed (Blatter A283 !).

N. Kanara : Kala-Nuddi River, Supa, on rocks, 2,000 ft., rainfall 100 in. (Sedgwick & Bell 4857 !), Halyal (Talbot 2221 !), Goond (Talbot 2202 !); Gersoppa Falls, on rocks in river-bed (Hallberg & McCann A279 !).

Ecology : Grows in large tufts in watercourses on rocks and sandy banks. The tufts look greyish, owing to a waxy substance covering the plant all over, but easily removeable.

Distribution : W. Peninsula, apparently endemic.

Explanation of Plate 56 : *Amphilophis concanensis* Blatter & McCann.

- | | |
|--------------------------------------|------------------------|
| 1. Lower invol. glume. | } Pedicelled spikelet. |
| 2. Upper invol. glume. | |
| 3. Lower floral glume. | |
| 4. Palea of lower floral glume. | |
| 5. Upper floral glume. | |
| 6. Palea of upper floral glume. | |
| 7. Stamens. | } |
| 8. Ligule. | |
| 9. Pedicelled and sessile spikelets. | |
| 10. Lower invol. glume. | } Sessile spikelet. |
| 11. Upper invol. glume | |
| 12. Lower floral glume. | |
| 13. Upper floral glume. | |
| 14. Filaments, ovary and styles. | |

7. *AMPHILOPHIS GLABRA* Stapf.

Amphilophis glabra Stapf in Fl. Trop. Afr. IX (1917) 172.

Andropogon glaber Roxb. Fl. Ind. I (1832) 267, Steud. Syn. Pl. Glum. I (1854) 392.

A. punctatus Trin. Ic. t. 328 (non Roxb.).

A. intermedius, var. *punctatus*, subvar. *glaber* Hack. Monogr. Androp. (1889) 487.

A. intermedius K. Schum. in Engl. Fl. Ost.-Afr. C. 98, Hook. f. Fl. Brit. Ind. VII (1896) 175; Cooke Fl. Bomb. II (1908) 980.

A. intermedius var. *punctatus* Stapf in Dyer Fl. Cap. VII, 345.

Amphilophis glabra Haines Bot. Bih. and Or. (1924) 1028 (non Stapf et partim).

It will be seen from the above synonymy that Stapf considers *Andropogon glaber* Roxb. as the type of the species. Of *Andropogon intermedius* R. Br. as conceived by Hackel he includes only the var. *punctatus*, subvar. *glaber*. Haines in his Bot. Bihar and Orissa 1028 adopts Stapf's name *Amphilophis glabra* with the following synonyms: *Andropogon intermedius* R. Br. and *A. glaber* Roxb., *A. punctatus* Roxb. and *A. montanus* Roxb. ‡

This is evidently not Stapf's *Amphilophis glabra* Haines includes *Andropogon intermedius* R. Br., whilst Stapf confines his species to *var. punctatus*. Haines has *A. punctatus* Roxb. as a synonym Stapf excludes it expressly.

Haines' description is much wider than that given by Stapf and includes Hackel's *vars. genuinus*, *Haenkei*, *punctatus* and *glaber*, and one of his own *var. hirta*. He says in a foot-note (p. 1029) "These varieties are after Hackel and were described before I consulted Stapf's Gramineae in Fl. Trop. Africa, where he reduces Hackel's *intermedius* to Roxburgh's *glaber*. The names (e.g., *genuinus*) in some cases become inapplicable if Roxburgh's *glaber* is the type. *Var. Haenkei* is, I think, a distinct species and easily distinguished in the field. It should be called *Amphilophis Haenkei*."

Haines seems to overlook the fact that Stapf's *glabra* is restricted to one of Hackel's varieties of *Andropogon intermedius*, viz., *punctatus* and that, consequently not all of Hackel's names can be applicable.

In our opinion Haines is not justified in calling his species *Amphilophis glabra* Stapf. As it includes practically the whole of *Andropogon intermedius* R. Br. taken in Hackel's sense he might have called it *Amphilophis intermedia* Haines if that name had not been preoccupied by Stapf (Fl. Trop. Afr. IX, 174).

We are not arguing the point whether Stapf or Haines is right in the treatment of *Andropogon intermedius* R. Br. et auctorum, good reasons can be adduced for both cases. All we wish to say is that Haines' *Amphilophis glabra* is not *A. glabra* Stapf.

Those who prefer to adopt Haines' *A. glabra* and Hackel's varieties might consider a remark made by Hackel himself (l. c. 487) "*A. fascicularis* Thwaites Enum. Pl. Zeyl. p. 437 non Roxb. complectitur varietates β [*Haenkei*] et δ [*punctatus*] formis *intermedius* (spiculis in eadem panicula mixtis) conjunctas. Etiam in *Bengalia transitus* et *spica varietas* β [*Haenkei*] proveniunt, in *Himalaya*, e gr. *pr. Smilah formae* inter δ [*punctatus*] et α [*genuinus*] *intermediae* inveniuntur."

We adopt Stapf's conception of *A. glabra* together with his description. Dr. Stapf was kind enough to name some of our Bombay specimens.

Description: Perennial. Rhizome very short, hard, innovations extravaginal, cataphylls ovate to lanceolate, acute, hard, smooth. Stems tufted, erect or shortly ascending, to over 1 m. high, rather stout, below, glabrous, 5-7-noded, simple or very sparingly branched. Leaf-sheaths terete, glabrous, smooth, the intermediate and upper mostly shorter than the internodes, nodes glabrous or the upper bearded. Blades linear, long-tapering to a setaceous point, hardly broader, not or slightly contracted at the base, up to over 30 cm. by 8.5 mm. (mostly narrower), pale green, often turning reddish or purplish, glabrous, rarely with very fine, long, spreading, white hairs at and above the ligule, smooth except at the margins, midrib rather stout to very stout downwards, lateral nerves 3-4 on each side, ligules truncate, very short, scarious.

Panicle narrowly oblong, 10-23 cm. by 25-38 mm., erect, primary axis much longer than the lowest racemes, somewhat stout and (at least when mature) stiff, smooth, shortly bearded at the branch axils, otherwise glabrous and smooth; branches whorled, up to 6 in a whorl or semiverticillate, or 2-nate or solitary from the weaker nodes, straight, 25-75 mm. long, the longer divided from 12 mm. above the base, few to 7-noded, secondary branches simple. Racemes 12-38 mm. long, straight or flexuous, usually purplish, inconspicuously white-villous; joints and pedicels 2-3 mm. long, ciliate, uppermost cilia much longer than the rest, up to 1 mm. long. Sessile spikelet pale green or purplish throughout, including the small minutely bearded callus 3-3.8 mm. long. Involucral glumes equal, lower truncate, slightly concave on the back, chartaceous-membranous, hairy below the middle, more rarely glabrous, keels rigidly ciliate upwards, intracarnal nerves 4-5, very fine, evanescent upwards with or without a pit above the middle, upper lanceolate, acute, 3-nerved, keel scabrid upwards, margins sparingly ciliate. Lower floral glume oblong, 2-7 mm. long, hyaline, nerveless, ciliate, upper an awn 6.3-12.7 mm. long, brown below, pale above the bend. Pedicelled spikelet neuter, mostly reduced to the glumes, narrowly linear-oblong to linear, 2.7-3.3 mm. long, glabrous, of the same colour as the sessile. Lower involucral glume rigidly and minutely ciliate, 5-9-nerved, often rolled in, not pitted, upper hyaline, nerveless, often minute.

Locality: Konkan. Pen (McCann A282!).

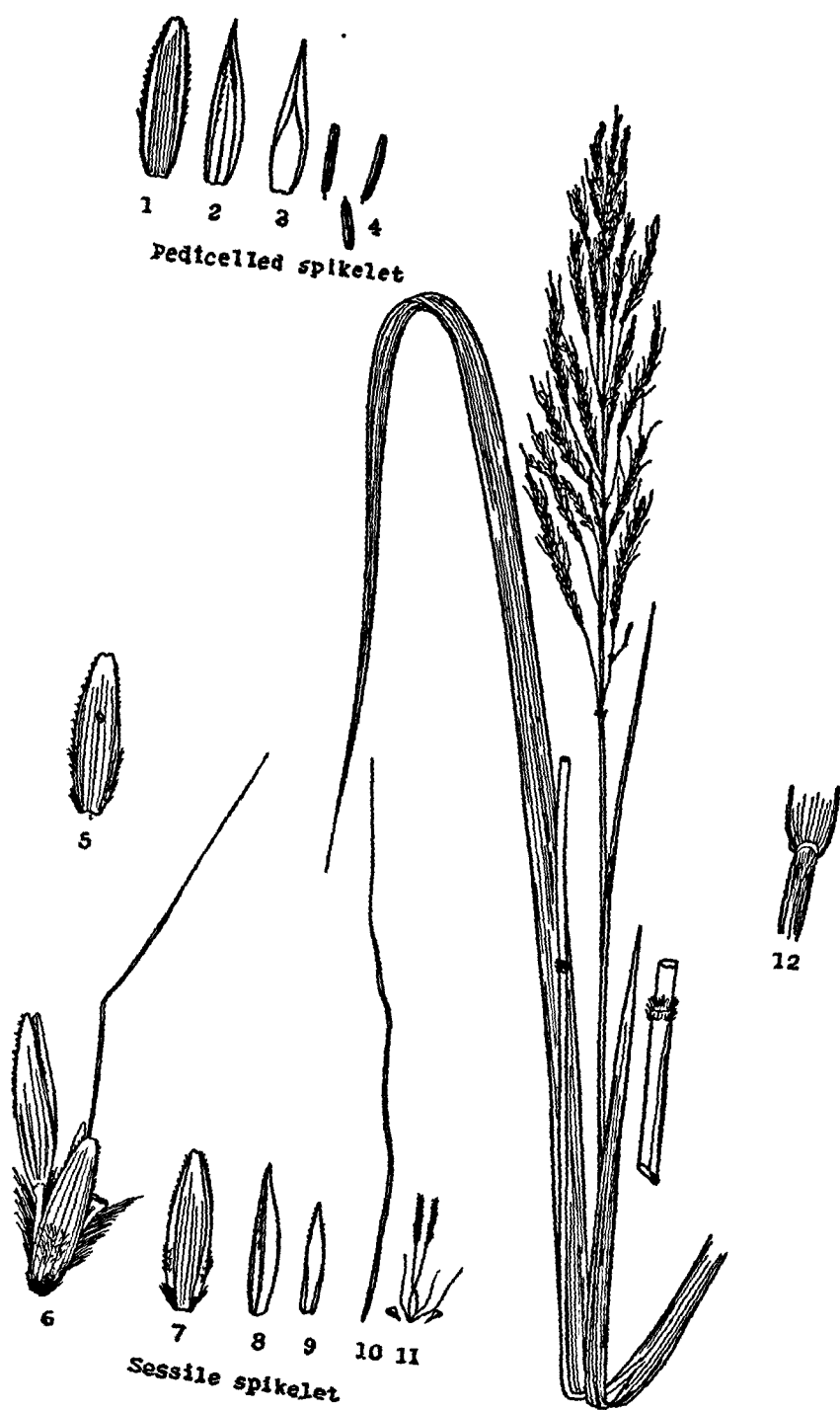
W. Ghats: Lonavla (Hallberg 9955!), Khandala, St. Mary's Ravine, in a watercourse (McCann 9435!).

Deccan: Pimpalgam, on the brink of a stream (Blude!).

Ecology: Densely tufted, growing in damp places in clumps and also on rocks in streams.

Distribution: More or less throughout India, tropical Asia, N. E. Australia, tropical Africa (Upper and Lower Guinea, Mozambique District, Nileland), Madagascar.

Economic uses: One of the common fodder grasses of the Deccan.



AMPHILOPHIS ODORATA A. CAMUS.

8. *AMPHILOPHIS ODORATA* A. CAMUS.

PLATE 57.

Amphilophis odorata A. Camus in Rev. Bot. Appl. et d'Agric. Colon. I (1921) 305.

Andropogon odoratus Dna. Lisboa in Journ. Bomb. Nat. Hist. Soc. IV (1889) 123, *cum is.* and VI (1891) 68, 203; Lisboa Bomb. Grasses (1896) 70; Hook. f. Fl. Brit. Ind. VII (1896) 177, Cooke Fl. Bomb. II (1908) 981.

Vernacular names : Vaidia-gavat, Usadhana, Bhos, Tambrut, Gavatvedi.

Etymology : *Odorata* in allusion to the highly scented inflorescence.

Description : Aromatic; stem erect, 0.9-1.2 m. high, as thick as a swan's quill at the base, sometimes branching below, leafy, nodes bearded. Leaves 30-60 cm. by 4-10 mm., linear-lanceolate, flat, acuminate, scaberulous on both surfaces and on the margins, bright green, with strong nerves; sheaths long, glabrous, smooth, compressed, the upper sheathing the base of the inflorescence; ligule small, membranous, truncate.

Racemes numerous, purplish, silky, suberect, slender, flexuous, densely fascicled, pedicellate, crowded at the end of a long peduncle and forming a dense panicle 5-10 cm. long; joints and pedicels flattened, with a translucent centre, silky-hairy, the joints 1.5 mm. long, the pedicels rather longer. Sessile spikelets purplish, 4 mm. long, oblong-lanceolate, acute; callus small, bearded with silky hairs, lower involucre glume thin, oblong-lanceolate, truncate, 7-nerved, softly hairy below the middle, rarely pitted; upper involucre glume very little longer than the lower and broader, thinly membranous, keeled, lower floral glume hyaline, oblong-lanceolate, shorter than the upper involucre glume, nerveless, awn 13-16 mm. long, slightly dilated towards the base. Pedicellate spikelets as long as or slightly longer than the sessile; lower involucre glume narrow, many-nerved, dorsally glabrous; upper involucre glume 3-nerved, ciliate; lower floral glume shorter, oblong, obtuse, nerveless.

The compressed sheaths, panicle racemes, villous lower involucre glume of the sessile spikelets, and aroma seem to distinguish this from *Amphilophis Kuntzeana*, which it strongly resembles in a dry state (Cooke).

Locality : Khandesh (Lisboa).

Konkan - Kharch (Mrs. Lisboa).

W. Ghats : Igatpuri (McCann A281¹); Lonavla, abundant (Mrs. Lisboa, Bhude¹).

Deccan : Plain at foot of Lohagad (McCann 9956¹), Pand, 20 miles west of Poona (Herb. Econ. Bot. Poona¹), Mawal, Poona Dist. (Woodrow).

Ecology : At Lonavla and in the neighbouring villages the fields at the end of the rains present a beautiful purple colour (Lisboa).

Distribution : W. Peninsula, apparently endemic

Economic uses : Contains an essential oil. (Lisboa)

Explanation of Plate 57 : *Amphilophis odorata* A. Camus.

- | | |
|--|------------------------|
| 1. Lower invol. glume. | } Pedicelled spikelet. |
| 2. Upper invol. glume. | |
| 3. Lower floral glume. | |
| 4. Stamens. | |
| 5. Lower invol. glume of sessile spikelet showing the occasional pit | } Sessile spikelet. |
| 6. Pedicelled and sessile spikelets. | |
| 7. Lower invol. glume. | |
| 8. Upper invol. glume. | |
| 9. Lower floral glume | |
| 10. Upper floral glume | |
| 11. Filaments, ovary, styles and lodicules. | } |
| 12. Ligule. | |

33 *DICHANTHIUM* Willemet.

Perennial or annual. Stems simple or branched, usually many-noded, bearded or beardless at the nodes.

Panicles usually subdigitate with a short or very short primary axis, rarely the latter elongated; racemes always shortly peduncled. Spikelets small, 2-nate, one sessile, the other pedicelled, similar in shape, different in sex, except the lowermost 1 or 2 pairs (sometimes 3 or 4) of each raceme which are (with occasional exceptions in *D. annulatum*) homogamous (male or neuter), in many-jointed shortly peduncled subdigitate, rarely subpanicled or racemously arranged, racemes, joints and pedicels filiform, solid, disarticulating subhorizontally

except the lowest barren pairs; fertile sessile and pedicelled spikelets deciduous, the former with the adjacent joint and pedicel. Sessile spikelet dorsally compressed, awned except the basal homogamous ones, callus small, shortly bearded. Involucral glumes equal, thinly chartaceous, lower usually very obtuse, 2-keeled, with narrow sharply inflexed margins, upper boat-shaped, 3-nerved, acutely keeled. Lower floral glume hyaline, nerveless, upper reduced to the hyaline base of a slender awn; palea minute or absent. Lodicules 2, minute, glabrous. Stamens 3. Stigmas exerted laterally at or above the middle or near the tips. Grain oblong, obtuse, dorsally compressed, embryo rather more than half the length of the grain. Pedicelled spikelet awnless. Lower involucral glume oblong, many-nerved, upper flat with sharply inflexed margins closing over the hyaline lower floral glume if present and the stamens, upper floral glume usually 0, never awned.

Species 10.—Tropical and warm-temperate regions of the Old World.

So far 4 species were known from the Presidency and described by Cooke under *Andropogon armatus* Hook. f., *A. Cookei* Stapf, *A. caricosus* Linn. and *A. annulatus* Forsk. To these we have added 2 new species: *Dichanthium panchganiense* Blatter & McCann, and *D. McCannii* Blatter.

A. Racemes digitate (sometimes solitary in *D. caricosus*), 25 mm. long or longer.

I. Lower involucral glumes of pedicelled spikelets armed with marginal bulbous-based bristles.

- | | |
|--|------------------------------|
| 1. Lower involucral glume of pedicelled spikelet always pitted | 1. <i>D. panchganiense</i> . |
| 2. Lower involucral glume of pedicelled spikelet not pitted. | |
| a. Ligule absent | 2. <i>D. armatum</i> . |
| b. Ligule present | 3. <i>D. McCannii</i> . |

II. Lower involucral glumes of pedicelled spikelets not armed with marginal bristles

- | | |
|--|--------------------------|
| 1. Nodes of stem glabrous; ligule a shortly ciliate small membrane | 4. <i>D. caricosum</i> . |
| 2. Nodes of stem bearded; ligule large, membranous | 5. <i>D. annulatum</i> . |

B. Racemes solitary, less than 25 mm. long 6. *D. serrafalcoides*.

1. *DICANTHIUM PANCHGANIENSE* Blatter & McCann.

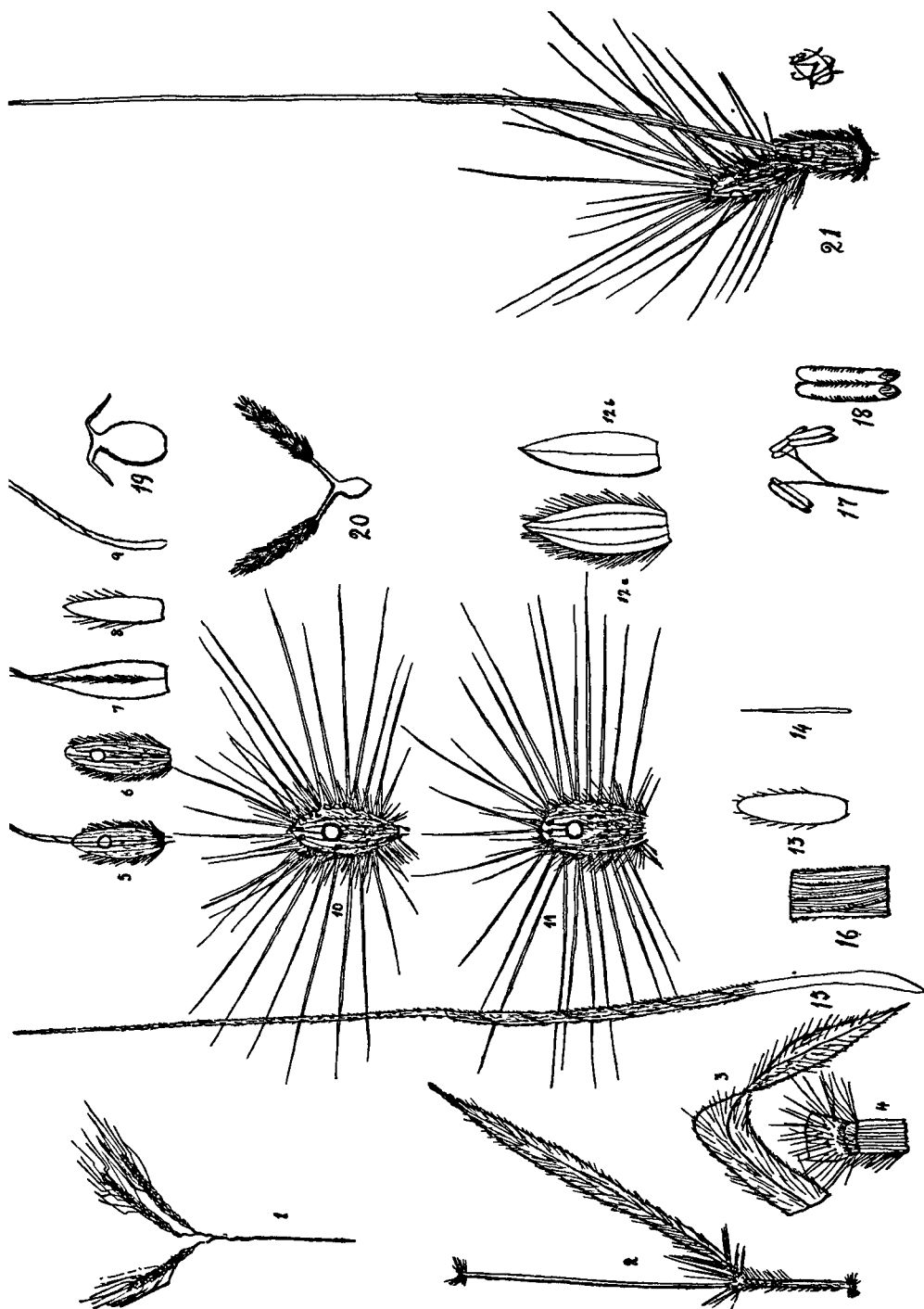
PLATE 58

Dichanthium panchganiense Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 357; 32 (1928) 425

Etymology: *Dichanthium* is derived from *discha*, meaning in two ways or parts, separately, and *anthos*, flower, very likely alluding to the binate spikelets.—Panchgani is a small town in the W. Ghats, Satara Dist

Description: Annual, erect; stems up to 35 cm. long, slender, tufted or not, simple or branched from near the roots, smooth and shining; nodes bearded. Leaves up to 8 cm. by 4 mm., linear, acuminate, broadest in the middle, short-ciliate on the margins, with long, bulbous-based hairs on the surfaces, which are much longer at base of the blade for about 5 mm., sheath lax, margins and upper two-thirds covered with bulbous-based hairs, mouth with much longer bulbous-based hairs; ligule narrow, membranous, lacerate.

Racemes digitate, 1-3, about 3 cm. long. One or two of the lowest pairs of spikelets male. Peduncles up to 8 mm. long, capillary; joints and pedicels slender, not grooved, terete, hairy. Spikelets about 18 pairs. Sessile spikelets 3 mm. long; callus very short, bearded with silky hairs, lower involucral glume thin, broadly oblong, subtruncate at apex, margins incurved, 7-nerved, always with a deep dorsal pit about $\frac{1}{3}$ from the apex, hirsute throughout except on the pit and the area between the pit and the apex, upper involucral glume oblong-lanceolate, longer than the lower, subacute at apex, keeled, glabrous except on the hairy keel. Lower floral glume oblong, flat, hyaline, nerveless, acute or obtuse at apex, a few scattered hairs on the margins; upper represented by a slender awn about 20 mm. long and twisted in the lower part. Pedicelled spikelets 4 mm. long, broader than the sessile. Lower involucral glume slightly convex, many-nerved, armed with spreading marginal bulbous-based bristles up to twice as long as the glumes, hairy between the bristles and on the dorsal surface, with a smooth shallow pit; upper slightly longer than the lower, broadly oblong, acute, 3-nerved, ciliate on



DICHANTHIUM PANCHGANIENSE BLATTER & MCCANN.

Desin: C. McCann.



Sessile spikelet

DICHANTHIUM ARMATUM BLATTER & McCANN

the margins. Lower floral glume oblong, obtuse, hyaline, nerveless, sparingly hairy; upper almost thread-like. Anthers yellow, filament forked, one branch bearing one anther, the other branch again forked.

Locality : *W. Ghats* : In the village and on Tableland of Panchgani (McCann !).

Ecology : The pits observed in the sessile spikelets contain a viscid substance. It is not impossible that the latter plays a part in pollination.

Distribution : Apparently endemic.

Explanation of Plate 58 : *Dichanthium panchganiense* Blatter & McCann.

- | | |
|--|------------------------|
| 1. Inflorescence. | |
| 2. Internode and leaf. | |
| 3. Upper part of leaf. | |
| 4. Ligule and lower part of leaf. | |
| 5. Sessile spikelet. | |
| 6. Lower invol. glume. | } Sessile spikelet. |
| 7. Upper invol. glume. | |
| 8. Lower floral glume. | |
| 9. Part of upper floral glume. | |
| 10. Pedicelled spikelet. | |
| 11. Lower invol. glume. | } Pedicelled spikelet. |
| 12a. Upper invol. glume, ventral side. | |
| 12b. Upper invol. glume, dorsal side. | |
| 13. Lower floral glume. | |
| 14. Upper floral glume. | |
| 15. Awn. | |
| 16. Part of awn. | |
| 17 & 18. Anthers. | |
| 19 & 20. Pistil. | |
| 21. Sessile and pedicelled spikelets. | |

2. *DICHANTHIUM ARMATUM* Blatter & McCann.

PLATE 59

Dichanthium armatum Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 425 with 1 plate

Andropogon armatus Hook. f. Fl. Brit. Ind. VII (1896) 197; Cooke Fl. Bomb. II (1908) 987.

Etymology : *Armatum* means armed, very likely alluding to the lower involucreal glume of the pedicelled spikelet which is armed with bristles twice or thrice its own length.

Description : Annual, erect; stems 30-45 cm. long, tufted, slender, simple or branched above, glabrous and shining, nodes bearded. Leaves 10-15 cm. by 4-6 mm., linear, copiously hairy on both surfaces with long bulbous-based hairs at the base; sheaths lax, glabrous except on the upper margins where they are more or less ciliate, the upper sheaths pale, spathiform, ligule 0.

Racemes 1.3-3.8 cm. long, subdigitate, 2-5, flexuous; lowest pair of spikelets male; peduncles 4-8 mm. long, capillary, with whorls of long white hairs in their axils, joints and pedicels slender, not grooved, terete, ciliate with silky hairs. Spikelets 10-20 pairs. Sessile spikelets 3 mm. long, callus very short, bearded, with silky hairs; lower involucreal glume thin, pale, nerveless, silky below the middle, often with a deep dorsal pit, margins narrowly incurved, keels ciliate, upper involucreal glume ovate, acute, nerveless, subchartaceous, silky-villous on the back, lower floral glume oblong or linear, obtuse, flat, hyaline, nerveless; upper floral glume represented by a slender awn 2.5 cm. long with an acute base. Pedicellate spikelets equalling the sessile but rather narrower, lower involucreal glume armed with spreading sub-marginal bulbous-based bristles often 6 mm. long or more, slightly convex, quite smooth between the bristles, many-nerved, keels ciliate; upper involucreal glume lanceolate, acute, 3-nerved, ciliate, lower floral glume oblong, obtuse, ciliate, upper floral glume very narrow.

Locality : *Konkan* - Stocks (*teste* Hook f.).

W. Ghats : Gira Hill, Khandala (McCann 9430! 9431!); Panchgani (Blatter & Hallberg B1212!); Pasarni Ghat (Blatter & Hallberg B1304!).

Deccan : Kalsabai Hills, Nasik Dist. (Patwardhan 1183!); Lohagad (McCann 3871!)

Ecology : This grass is usually found on exposed hill-tops growing among other plants on rather hard and stony soil.

Distribution : W. Peninsula, apparently endemic.

Explanation of Plate 59 : *Dichanthium armatum* Blatter & McCann.

- | | |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | |
| 2. Lower invol. glume | } Sessile spikelet. |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume | |
| 6. Grain and styles. | |

3. *DICHANTHIUM MCCANNII* Blatter.**PLATE 60.**

Dichanthium McCannii Blatter in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 357, *cum* ic.; 32 (1928) 425.

Description : An erect tufted grass, stems up to 45 cm. long, slender, simple or branched from about the middle, glabrous, shining, nodes densely long-bearded; internodes up to 7 cm. long. Leaves up to 10 cm. by 6 mm., linear-lanceolate, broadest at base, amplexicaul, covered all over with bulbous-based hairs which are much longer at the base for about 15 mm.; sheaths lax, covering the internodes for $\frac{1}{2}$ and more, glabrous except on the outer margin and the upper third of the whole sheath which are covered with bulbous-based hairs; ligule narrow, 1 mm. broad, made up of bristles united at the base.

Racemes solitary or 2, up to 37 mm. long, the 3 or 4 lowest pairs of spikelets all male and alike in shape, peduncles of binate racemes about 1 cm. long, capillary; joints and pedicels slender, of the lower 3 or 4 pairs of spikelets glabrous, of the rest a line of ciliate hairs all along on one side of joint and pedicel and with a few cilia on the opposite side. Spikelets up to 17 pairs. Sessile spikelets 4 mm. long; callus very short, bearded; lower involucreal glume pale, 7-nerved, the central nerve running only half way up, 4 mm. long, not keeled, stiff-haired in the upper two-thirds (no dorsal pit), margins much incurved, tip subobtusate, purplish; upper involucreal glume slightly longer than the lower, broadly lanceolate, acute, margin incurved, keeled on the back, otherwise nerveless, hairy towards the tip along the margin and on keel. Lower floral glume narrowly oblong, rounded at apex, flat, hyaline, nerveless; upper represented by a slender awn, 28 mm. long, twisted in the middle third. Pedicellate spikelet 1 mm. longer than the sessile and broader. Lower involucreal glume 5 mm. long, narrowly ellipsoid, acute at apex, slightly convex, strongly 10-nerved, very narrowly winged in the upper third, wings purplish, spinous-serrate with stiff hairs, armed with spreading submarginal bulbous-based bristles which are often as long as the glume, otherwise glabrous; upper involucreal glume broadly lanceolate, slightly longer than the lower, 3-nerved, apex acute, margins broadly incurved, outer side glabrous, inner side silky-hairy. Lower floral glume oblong, obtuse at apex, as long as the upper involucreal glume, hyaline, margins silky-hairy in the upper half, upper narrowly oblong-lanceolate, hyaline, slightly shorter than the lower, apex acute.

Locality : W. Ghats : East of the Third Tableland of Panchgani (McCann!).

Distribution : Apparently endemic.

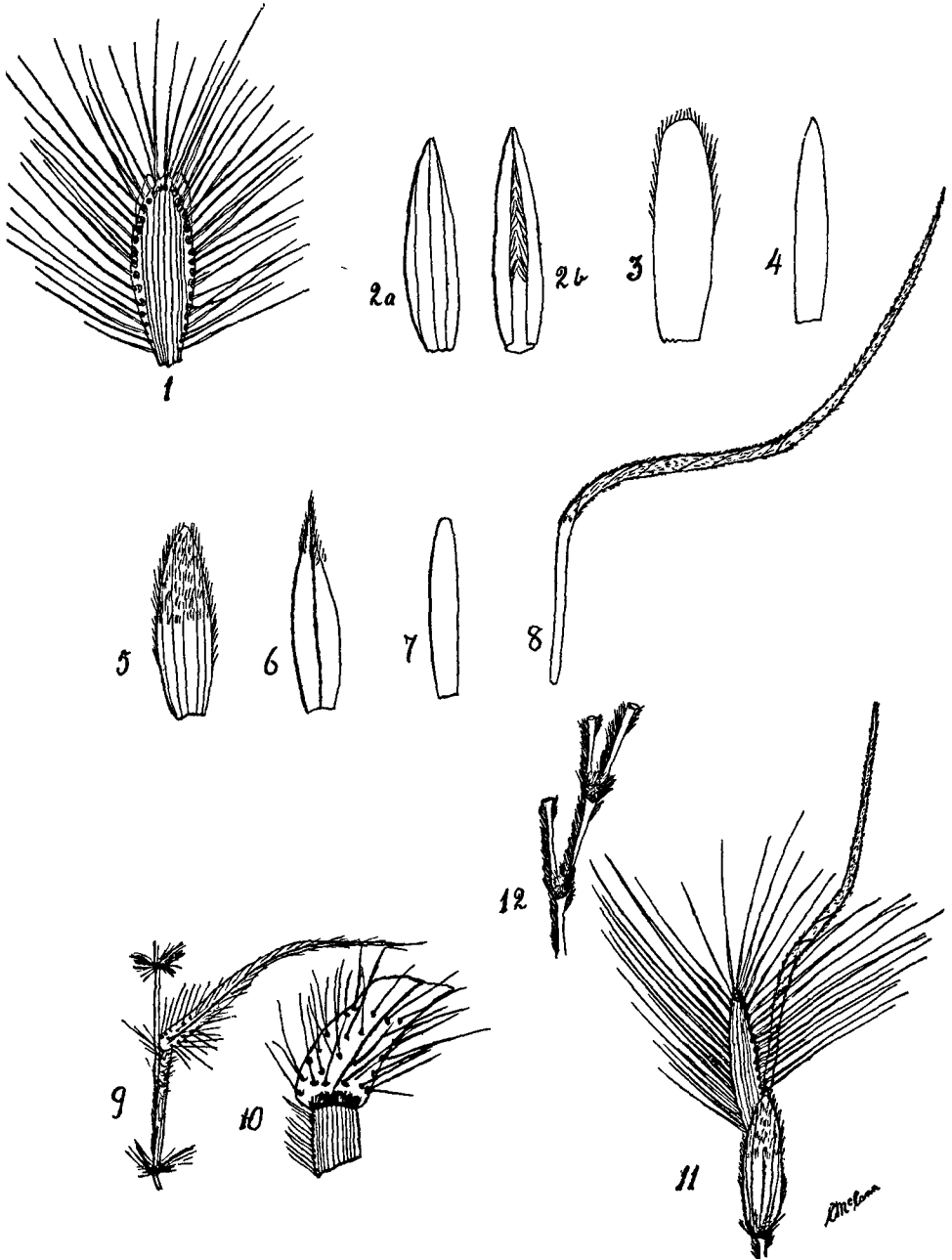
Explanation of Plate 60 : *Dichanthium McCannii* Blatter.

- | | |
|---|------------------------|
| 1. Lower invol. glume. | |
| 2a. Dorsal side of upper invol. glume. | } Pedicelled spikelet. |
| 2b. Ventral side of upper invol. glume. | |
| 3. Lower floral glume. | |
| 4. Upper floral glume. | |
| 5. Lower invol. glume. | } Sessile spikelet. |
| 6. Upper invol. glume. | |
| 7. Lower floral glume | |
| 8. Upper floral glume. | |
| 9. Internode and leaf | |
| 10. Lower part of leaf with ligule. | |
| 11. Sessile and pedicelled spikelets. | |
| 12. Joints and pedicels. | |

4. *DICHANTHIUM CARICOSUM* A. Camus.**PLATE 61.**

Dichanthium caricosum A. Camus in Bull. Mus. Hist. Nat. (Paris) 27 (1921) 549; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 425.

Andropogon caricosus Linn. Sp. Pl. ed. 2 (1763) 1480; Hack. Monogr. Androp. (1889) 567; Hook. f. Fl. Brit. Ind. VII (1896) 196, Cooke Fl. Bomb. II (1908) 987; Hauss. Bot. Bah. and Or. (1924) 1039



DICHANTHIUM MCCANNII BLATTER.

Desig. C. McCann.



DICHANTHIUM CARICOSUM A. CAMUS.

- A. tenellus et binatus* Roxb. Fl. Ind. I (1832) 254, 255.
A. filiformis Pers. Syn. I (1805) 103.
A. serratus Retz. Obs. V (1789) 21; Trin. Fund. Agrost. (1820) 203.
A. australis Poir. Encycl. Suppl. I, 585.
A. incurvatus Koen. ex Trin. in Spreng. Entdeck. II, 91.
A. Koenigii Steud. Syn. Pl. Glum. (1855) 381.
A. mollicomus Kunth Rev. Gram. I (1829) 365, Enum. Pl. I (1838) 497.
Heteropogon concinnus Thw. Enum. Pl. Zeyl. (1864) 368.
Lepeocercis digitatus Royle III Bot. Himal. 416.
Dichanthium nodosum Usteri Ann. XVIII (1796) 11.
Diplasanthera lanosum Desv. Opus. (1831) 67, t. 5, fig. 1.

Three authors have made the new combination *Dichanthium caricosum*: (a) A. Camus l. c.; (b) Stapf in Ridley Fl. Malay Penins. V (1925) 210, (c) Haines in Bot. Bihar and Orissa (1924) 1039. A. Camus has therefore to be adopted as authority for *D. caricosum*.

We are not trying to describe varieties or forms of this very variable species.

Vernacular names: Marvel, Zinzvo, Tela, Jetara, Chaoria, Patang

Description: Stems erect or ascending from a creeping base, forming tufts at the rooting nodes, 30-60 cm. high, stout or slender, grooved on one side, leafy; nodes usually glabrous, less frequently bearded. Leaves 15-20 cm. by 2.5-4 mm., linear, finely acuminate, flat, glabrous, sometimes ciliate at the base, the margins scaberrulous; sheaths glabrous, compressed, the mouth not auricled; ligule a narrow shortly ciliate membrane.

Racemes 2.5-10 cm. long, solitary, 2-nate or subdigitately paniculate, 3-6 mm. broad, pale green or silvery, the lower sometimes stipitate; joints and pedicels about one-third as long as the sessile spikelets, ciliate on one margin. Sessile spikelets 4 mm. long, callus short, bearded, lower involucre glume 3 mm. long, obovate, concave, ciliate at the rounded or truncate apex, 7-9-nerved, subchartaceous, upper involucre glume longer than the lower, ovate-lanceolate, acute, often apiculate, subchartaceous, ciliate, 3-nerved, lower floral glume as long as the lower involucre glume, ovate-oblong, subacute, hyaline, nerveless, ciliate, upper floral glume represented by the hyaline not dilated base of the awn; awn 2.2 cm. long, the hyaline base about 3 mm. long. Pedicellate spikelets nearly as long as the sessile, lower involucre glume obovate, obtuse, with narrowly incurved margins and ciliate keels, many-nerved, upper involucre glume as in the sessile spikelet, lower floral glume ovate-oblong, subacute, hyaline, ciliate; upper floral glume nearly as long as the lower, linear-oblong, obtuse, hyaline. Anthers 2.5 mm. long.

This species can, according to Burns, and others¹ be distinguished from *D. annulatum* Stapf by the following characters—

	<i>Dichanthium caricosum</i> .	<i>Dichanthium annulatum</i> .
Habit	Big and tufted with terminal and axillary inflorescences.	Medium size with terminal inflorescences.
Nodal hairs on stem . .	Short.	Long.
Colour of inflorescence .	Light purplish green.	Purple.
Hairs of inflorescence .	Short	Long.

Haines l. c. believes there is no single character by which *D. caricosum* can be distinguished from *D. annulatum*. "I have," he says, "tested all those given in the F. B. I. and found them fail on specimens named by Sir J. D. Hooker himself; the key characters in Bengal Plants are also unworkable as applied to the same specimens, many of which have bearded nodes, and the character of spiral or subdistichous spikelets is difficult to apply. Linnaeus described *Andropogon caricosus* as with solitary spikes, and Willdenow (sic!) adds 'leaves with sparse hairs and sheaths hirsute at the base' (probably he refers to the nodes)."

In his key-characters Haines says that in *D. caricosum* the callus is glabrous. This seems to be a mistake. Hackel calls the callus "*brevissime barbatus*", Cooke has "bearded", Ranga-chariar describes it as "short and shortly hairy below". We have always found it bearded.

Locality: Gujarat: Surat, roadsides (Sedgwick 315!).

Khandesh: Toramal (McCann 9669!); Tapti, N. E. of Bhusawal (Hallberg 5111!); N. slope of Chansel (McCann 9968!).

¹ W. Burns, L. B. Kulkarni and S. R. Godbole: A Study of Some Indian Grasses, in Mem. Dept. Agr. Ind. XIV (1925) 46.

Konkan : Parsik, railway tract (McCann 9633 !).

W Ghats : Panchgani (Blatter 3803 !, Blatter & Hallberg B1223 !); between Mahabaleshwar and Panchgani, 4,000 ft. (Sedgwick & Bell 4743 !).

Deccan : Junnar (Mamlatdar of Junnar !); Shevgaon (Mamlatdar of Shevgaon !); Lohagad, half way up (McCann 9627 !); Agricultural College Farm, Poona (Herb. Econ. Bot. Poona !); Khed (Mamlatdar of Khed !); Purandhar (McCann 5570 !); Bairawadi, Purandhar (McCann 5075 !).

S. M. Country : Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 1828 !).

N. Kanara : Haiyal (Talbot 2427 !).

Ecology : A subgregarious species, very abundant in the Mallad tract of the Carnatic. Ranks second to *Thelepogon elegans* in monsoon grass headloads. A most delicate tall grass, often appearing in hedges.

Distribution : India, Burma, Ceylon, Mauritius, China.

Economic uses : A good fodder grass

Explanation of Plate 61 : *Dichanthium carcosum* A. Camus.

- | | |
|--|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol glume. | |
| 3. Upper invol glume. | |
| 4. Lower floral glume. | |
| 5. Stamens, ovary, styles and lodicules. | |
| 6. Upper floral glume. | |

5. *DICHANTHIUM ANNULATUM* Stapf.

PLATE 62

Dichanthium annulatum Stapf in Fl. Trop. Afr. IX (1917) 178, Haines Bot. Bih. and Or. (1924) 1039; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 426.

Andropogon annulatus Forsk. Fl. Aeg.-Arab. (1775) 173; Duthie Fodder Grasses N. Ind. (1888) 33, t. 20; Hack. Monogr. Androp. (1889) 570; Lisboa Bomb. Grasses (1896) 82; Hook. f. Fl. Brit. Ind. VII (1896) 196; Cooke Fl. Bomb. II (1908) 988; Boiss. Fl. Or. V (1884) 463.

A. Bladhus Retz. Obs II (1781) 27; Roxb. Fl. Ind. I (1832) 259; Duthie Grasses N. W. Ind. (1883) 19.

A. comosus Link Enum Hort. Berol. I (1827) 239

A. obtusus Nees in Hook. & Arn Bot. Beech. Voy 243 (excl. syn. Roxb.).

A. scandens Roxb l. c. 258; Grah. Cat. Bomb. Pl (1839) 238; Dalz. & Gibs Bomb. Fl. (1861) 301.

Leptocercis annulata Nees Fl. Afr Austr. (1841) 98.

Vernacular names : Zinjoo, Handi daroya, Daroya, Dhrow, Zinzma, Jinjva, Marvel, Sheda, Sam-payen, Palvan-hullu, Marwalyan-hullu.

Description : Perennial, densely tufted, stem erect or ascending, usually simple, 15-90 cm. long, nodes usually bearded. Leaves 7.5-30 cm. by 3-6 mm, linear, finely acuminate, glaucous, glabrous or more or less sparsely hairy above with small bulbous-based hairs, the margins scabrid, sheaths bearded at the tip, ligule nearly 3 mm. long, oblong, obtuse, membranous, glabrous

Racemes 2.5-6.3 cm long, subdigitately fascicled, pinkish or nearly white, peduncles glabrous, 4-13 mm long, joints and pedicels $\frac{1}{2}$ as long as the spikelets, sparingly ciliate. Sessile spikelets about 4 mm. long, but variable in length, elliptic-oblong, closely imbricating, callus thick, shortly bearded at the base, lower involucrel glume elliptic-oblong, obtuse, ciliate at the rounded or truncate apex, thin, margins narrowly incurved, the keels ciliate, the back hairy or glabrous, 5-9-nerved, the nerves not reaching the tip; upper involucrel glume equalling the lower but narrower, lanceolate, subacute, glabrous or ciliate, 3-nerved, lower floral glume as long as the upper involucrel glume, linear-oblong, obtuse, nerveless, glabrous; upper floral glume represented by the flattened white base of a scabrid slender awn 2 cm. long. Pedicellate spikelets about equalling the sessile, male or neuter; lower involucrel glume elliptic-oblong, obtuse, 7-11-nerved, the keels bristly; upper involucrel glume narrower, 3-nerved; lower floral glume ciliate; upper floral glume small or obsolete.

Locality : *Sind* : Jamesabad (Sabnis B972 !); Mirpurkhas (Sabnis B1028 ! B1185 !); Hyderabad (Sabnis B51 !), Pad-Idan (Sabnis B515 !); Larkana (Sabnis B462 !); Nasarpur (Sabnis B1140 !); Tatta, Kulan Kote Lake (Blatter & McCann D667 !); Tatta, tombs (Blatter & McCann D668 !).

Gujarat : Kabinwad (Chibber !); Nadiad Farm (Herb. Econ. Bot. Poona !).



Sessile spikelet

DICHANTHIUM ANNULATUM STAPF.

Desm : R. K. Bhada.



Sessile spikelet

ILLUSTRATIONS OF GRASSES BY DIETTER & MCCANN

Khandesh : Amboli, Bor, River (Blatter & Hallberg 5148 !); Dadgaum (McCann 9665 !); Tannal (McCann 9670 !), Bor, Bor, River (Blatter & Hallberg 4428 !); Umalla, Tapti Ban (Blatter & Hallberg 5228 !)

Konkan : Sion (McCann 3672 !); Sewri (McCann 3587 !); Parsik, railway line (McCann 9654 !); Campoli (McCann 5356 !).

W Ghats : Khandala, very common (McCann 5297 !).

Deccan : Kirkee to Poona, railway line (Garade 83 !); College garden, Poona (Garade !); Chattershimji Hill, Poona (Ezekiel), Trimbak (Chibber !); Manmad (Blatter 9970 !); Purandhar, north foot (McCann 9421 !)

S. M. Country : Dernkop, 1,800 ft, rainfall 40 in (Sedgwick 3984 !).

N. Kanara : Halyal (Talbot 2081 !), Kulgi (Talbot 2299 !).

Ecology : Often grows in hedges and on roadsides, but chiefly on old pasture grounds. Rangachariar calls it "another common grass flourishing in cultivated fields and gardens and seems to like sheltered places" See also Burns, Kulkarni and Godbole A Study of Some Indian Grasses and Grasslands (1925) 45-47

Distribution : Tropical Africa (Nileland, Mozambique Dist.), from Morocco through N. Africa, the Orient and India to China and Australia, Pacific Islands.

Economic uses : A good fodder grass. "It is also the opinion of the cattle who will sort these species (*Dichanthium annulatus* and *caricosus*) out of a mixture and eat them first." (Burns). Lisboa calls it an excellent fodder grass either in the green or dry state "It yields a considerable amount of fairly good fodder which is largely made use of" (Duthie). Rangachariar says that cattle eat the grass eagerly both when young and in flower

Explanation of Plate 62 : *Dichanthium annulatum* Stapf.

- | | |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Stamens, ovary and styles. | |
| 6. Upper floral glume. | |

6. *DICHANTHIUM SERRAFALCOIDES* Blatter & McCann.

PLATE 63

Dichanthium serrafalcoides Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 426.

Andropogon Cookei Stapf ex Woodrow in Journ. Bomb. Nat. Hist. Soc. 13 (1898) 438 (*nomen tantum*); Cooke Fl. Bomb. II (1908) 986 (*descriptio*).

A. (Dichanthium ?) serrafalcoides Cooke et Stapf in Kew Bull. (1908) 450.

The systematic position of this species is somewhat doubtful. Cooke already found that it does not agree with Haekel's subgenus *Dichanthium*, but he adds : "it is the only subgenus into which it will fit at all." Cooke and Stapf, when describing the same species under a different name, remark : "*Ob spiculis secundariis infimis saepissime neutras caeterum eadem forma ac fertiles ut vs ad Dichanthium referendus, sed nulli speciei arcte affinis, spiculis majoribus in racemos spiculis Serrafalcoi haud dissimiles congestis insignis.*"—Following this suggestion we have put it under *Dichanthium*.

Etymology : *Serrafalcoides* is derived from *serra*, a saw and *falcis*, a sickle, meaning a sickle-like saw. What this alludes to exactly we are unable to say.

Description : A weak straggling much-branched annual, stems reaching 60 cm. long, very slender, smooth, quite glabrous; nodes glabrous. Leaves 7.5-15 cm. by 3-6 mm., flaccid, finely pointed, sparsely clothed with bulbous-based hairs on both sides, scabertulous, sheaths glabrous; ligule hyaline, ovate, ciliate.

Racemes 13-20 mm. long, solitary on the apices of the stems and branches, joints between the 2 or 3 lowest nodes continuous, short, cylindric, glabrous, the others about 1.7 mm. long, disarticulating, subclavate, densely ciliate on one side with long silky hairs which equal or exceed the pedicels, lowest pedicels very short, glabrous, the others 2 mm. long, ciliate on one side with long silky hairs, dilated into an oblique sac-like mouth above, and produced into a projecting flat horn. Spikelets closely imbricate, straw-coloured, scarious. Sessile spikelets 2-sexual (except the lowest which is very often neuter); lower involueral glume 8 mm. long, oblong or elliptic-oblong, acute, or shortly bifid, or sublacerate at the apex, the margins narrowly infolded, rigid, the keels deeply winged with subequal scarious wings about 1.25 mm. deep and more or less toothed on the margins, 7-9-nerved between the keels, the keel-nerve running into the points of the wings, upper involueral glume shorter than the lower, oblong-lanceolate, obtuse, apiculate, 3-nerved, chartaceous, margins narrowly incurved, keels glabrous; lower floral glume 4 mm. long, oblong, obtuse, hyaline, nerveless, glabrous; upper floral glume

reduced to the white flattened lanceolate base of the awn; awn 2 cm. long, the column much twisted. Pedicellate spikelets longer than the sessile, obliquely lanceolate; lower involucre glume nearly 13 mm. long, acute, unequally winged, many-nerved, upper involucre glume 4 by 2 mm., lanceolate, acute, 5-nerved, chartaceous, lower floral glume 3 mm. long, oblong, obtuse, hyaline; upper floral glume 2.5 mm. long, oblong, obtuse, hyaline. Anthers 1.5 mm. long. Grain 4 mm. long, oblong, compressed.

Locality: *W. Ghats:* Lonavla (Bhide !); Khandala, Echo Point (McCann 9403 !); Kalanbai Hills (Patwardhan !); Sakar-Pathar near Lonavla (Woodrow !); Mahabaleshwar (McCann !); Panchgani (McCann !, Blatter & Hallberg B1250 !).

Ecology: A weak straggling gregarious species usually growing in shaded or partially shaded localities. Occupies situations which are protected from too strong breezes. It roots at the nodes below. The spike is bent over and pendulous. It begins to flower late in September.

Distribution: W. Peninsula, apparently endemic.

Explanation of Plate 63: *Dichanthum serrafalcoides* Blatter & McCann.

- | | |
|--------------------------------------|---------------------|
| 1. Ligule | |
| 2. Pedicel | |
| 3. Pedicelled and sessile spikelets. | |
| 4. Lower invol. glume. | } Sessile spikelet. |
| 5. Upper invol. glume. | |
| 6. Lower floral glume. | |
| 7. Upper floral glume. | |
| 8. Grain. | |

34. EREMOPOGON Stapf

Perennial, rarely annual, grasses with slender culms, simple below, more or less branched above, the branches often gathered in fastigate bundles, each supported by a bladeless sheath and terminated by a solitary raceme.

Spikelets small, 2-nate, one sessile, the other pedicelled, similar in shape, different in sex, on the fragile rachis of many-jointed solitary spatheate racemes which are frequently gathered in fastigate bundles, rarely the lowermost 1-3 pairs homogamous; joints and pedicels filiform, compressed, solid or slightly grooved, disarticulating horizontally; spikelets deciduous, the sessile with the adjacent joint and pedicels. Florets 2 in the fertile spikelets, the lower reduced to an empty floral glume, the upper hermaphrodite; 1 (the lower) in the pedicelled spikelets male or neuter, the upper quite suppressed, or both suppressed. Sessile spikelet dorsally compressed, awned, callus small, shortly bearded. Involucral glumes equal, thinly chartaceous to membranous, lower 2-keeled, with narrow inflexed margins, upper boat-shaped, 3-nerved, acutely keeled. Floral glume of lower floret hyaline, nerveless, of upper floret reduced to a hyaline upwards firmer linear stipe passing into a slender awn. Stamens 3. Stigma exserted laterally near the middle of the spikelet, longer than the styles. Grain unknown, Pedicelled spikelet awnless; floral glume if present hyaline, nerveless.

Species about 5.—Tropical and warm-temperate parts of the Old World.

Cooke knew 1 species from the Presidency which he described under the name of *Andropogon foveolatus* Del. We add *Eremopogon Paranjpyeanum* Blatter & McCann.

- | | |
|---|------------------------------|
| 1. Lower involucre glume of sessile spikelet 4-nerved | 1. <i>E. foveolatus</i> . |
| 2. Lower involucre glume of sessile spikelet faintly 5-7-nerved | 2. <i>E. Paranjpyeanum</i> . |

1. EREMOPOGON FOVEOLATUS Stapf.

PLATE 64.

Eremopogon foveolatus Stapf in Fl. Trop. Afr. IX (1917) 183; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 427.

Andropogon foveolatus Del. Fl. d'Egypt. (1812) 160, t. 8, fig. 2; Duthie Grasses N. W. Ind. (1883) 20, Fodder Grasses N. Ind. (1888) 34, t. 21, Lisboa Bomb. Grasses (1896) 64; Hack. Monogr. Androp. (1889) 402; Hook. f. Fl. Brit. Ind. VII (1896) 168; Cooke Fl. Bomb. II (1906) 977.

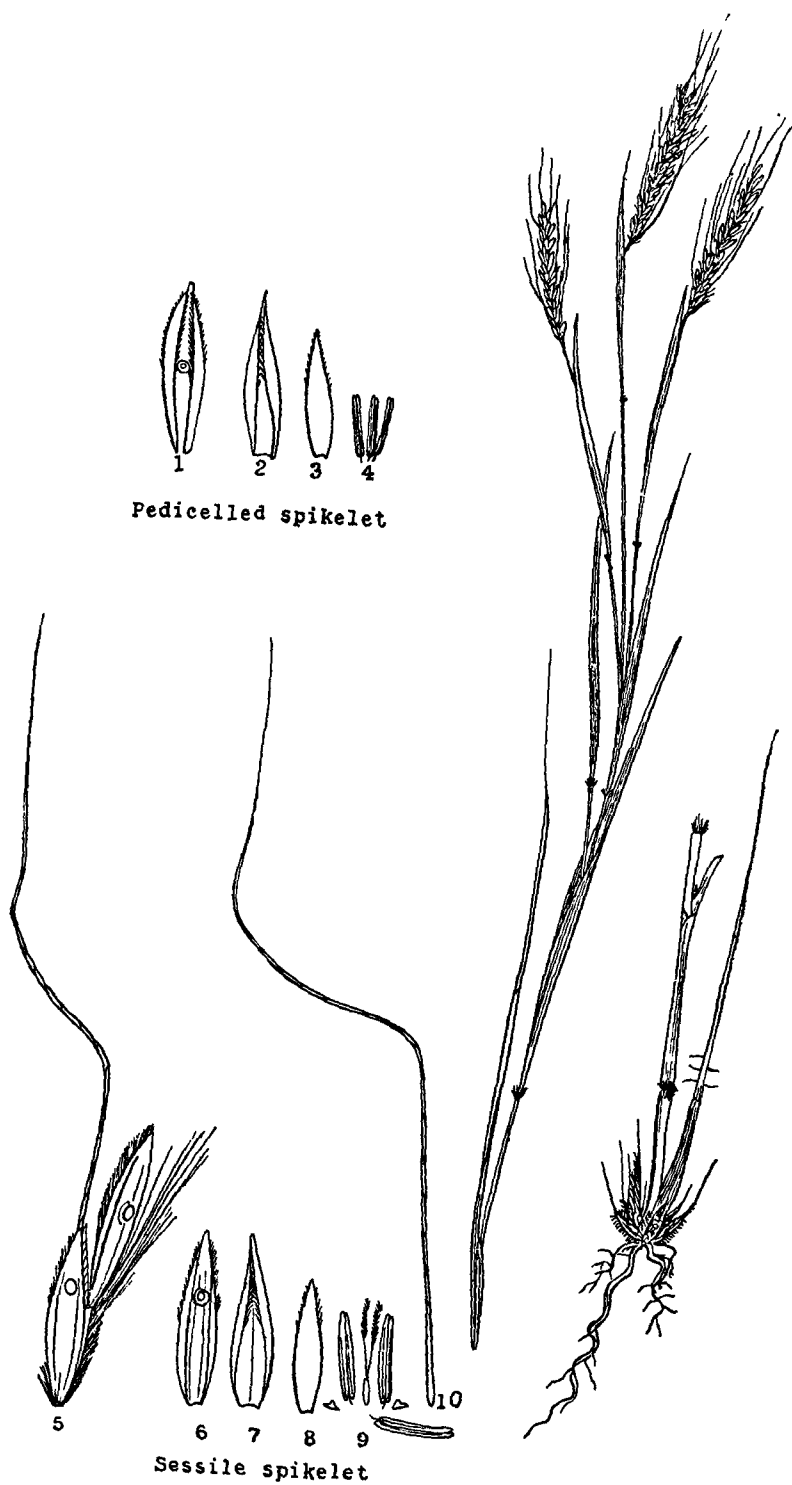
A. strictus Roxb. Fl. Ind. I (1832) 260.

A. Orihis Schult. Mant. II, 455.

A. monostachyus Spreng. Pug. II, 9.

A. foveolatus var. *plumosus* Terracino in Ann. Istit. Bot. Roma V (1894) 94.

Vernacular names: Ghandel, Marvel, Boari, Kard.



Pedicelled spikelet

Sessile spikelet

EREMOPOGON FOVEOLATUS STAFF.

Dehn. B. K. Bhode.

Etymology : *Eremopogon* is derived from *eremos*, empty, and *pogon*, beard—*Foveolatus* means pitted and refers to the pitted lower involucreal glume

Description : Stems 30-60 cm. long, densely tufted, usually decumbent at the base, then geniculate ascending, very slender, glabrous, nodes bearded. Leaves 7.5-15 cm. by 1.2-2.5 mm., linear, scabrous beneath, sheaths shorter than the internodes, scabrous or glabrous, the basal sheaths silky-villous, ligule short, truncate, hyaline, ciliate

Racemes 2.5-3.8 cm. long, solitary; peduncles capillary, erect, usually far exerted beyond the slender spathe; joints and pedicels slender, ciliate on 2 opposite sides with long silky hairs, shorter than the sessile spikelets. Spikelets 4 mm. long (the sessile and pedicellate equal), oblong-lanceolate, glabrous, purplish, callus small, shortly hairy at the base, lower involucreal glume 4 mm. long, flat, lanceolate-oblong, subobtusate, with narrowly involute margins, 4-nerved, usually marked with a deep pit above the middle; upper involucreal glume equal to the lower, lanceolate, acute, obscurely 3-nerved, lower floral glume much shorter, oblong-lanceolate, glabrous, nerveless, upper floral glume reduced to an awn 13-16 mm. long, the column about equalling the subulate portion. Anthers 2.5 mm. long. Pedicellate spikelets, pedicels 2.5 mm. long. Glumes 2, lower involucreal glume 4 mm. long, lanceolate, acute, with slightly incurved margins, the keels above aculeately scabrid, 5-nerved, pitted or not; upper involucreal glume equalling the lower, linear-lanceolate, acute, 3-nerved

Locality : *Sind* : Sehwan to Laki, foot of hills (Sabnis B651 !)

Cutch : Bhuj Hill (Blatter 3765 !)

Gujarat : Road to Lasandra (Chibber !).

Khandesh : Umalla, Tapti Bank (Blatter & Hallberg 5222 !), Bhusawal (McCann 4243 !); Bor, Bor River (Blatter & Hallberg 4309 !), Naradana (Blatter & Hallberg 5180 !)

Konkan : Parel, poor specimen (McCann 5373 !)

W. Ghats : Panchgani (Blatter & Hallberg B1245 !), roadside, 4,000 ft., rainfall 60 in. (Sedgwick & Bell 4735 !).

Deccan : Yeola (Herb Econ Bot. Poona !); Arangaon, Ahmednagar (Ryan !); Chattarshinji Hill (Ezekiel !), Deolali (Blatter 4550 !), Manmad (Blatter A261 !)

S M Country : Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 1825 !); Haveri (Talbot 2229 !)

Ecology : A sporadic grass. Very abundant on barren uplands in the Dharwar Dist. On rocky ground in the Deccan (Lisboa).

Distribution : Tropical Africa (Upper Guinea, Nileland), Canaries, from Egypt and tropical Arabia to the drier parts of India

Economic uses : A good fodder grass.

Explanation of Plate 64 : *Eremopogon foveolatus* Stapf.

- | | | |
|--|---|----------------------|
| 1. Lower invol. glume. | } | Pedicelled spikelet. |
| 2. Upper invol. glume. | | |
| 3. Lower floral glume. | | |
| 4. Stamens. | | |
| 5. Pedicelled and sessile spikelets. | } | Sessile spikelet. |
| 6. Lower invol. glume. | | |
| 7. Upper invol. glume. | | |
| 8. Lower floral glume. | | |
| 9. Stamens, ovary, styles and lodicules. | | |
| 10. Upper floral glume | | |

2. EREMOPOGON PARANJPYEANUM Blatter & McCann.

Eremopogon Paranjpyeanum Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 427.

Andropogon Paranjpyeanum Bhude in Journ. and Proc. Asiat. Soc. Beng. New series, VII (1911) 514.

Description : A delicate-looking grass. Stems slender, erect, 30-45 cm. high, upper nodes pubescent, leaves 2.5-7.5 cm. by 2 mm., subcordate at base, long-hairy on both sides, the margins thickened and minutely irregularly repand and spinulosely serrulate; sheaths glabrous; ligule a short erose membrane.

Racemes solitary, 12-25 mm. long (without the awns), on a very slender peduncle. Sessile spikelets 3 mm. long. Lower involucreal glume oblong, obtuse, faintly 5-7-nerved, glabrous, margins narrowly incurved, keels shortly ciliate at the apex, upper just a little longer than the lower, 3-nerved, oblong, apiculate. Lower floral glume shorter than the involucreal glumes, hyaline and with ciliate margins, epaleate, upper floral glume consisting of the narrow base of the awn, just a little more than half as long as the lower involucreal glume, obscurely margined and 1-nerved with 2 obscure narrow lobes at the apex, and an interposed slender, twisted,

scabrid awn about 4 cm. long, bearing a bisexual flower. Pedicelled spikelets about $\frac{1}{2}$ in. long. Lower involucrel glume oblong, obtuse, 7-9-nerved, margins incurved and broadly winged at the keels, wings shortly ciliate towards the apex, upper involucrel glume a little shorter than the lower, oblong, acute, 3-nerved, margins ciliate. Lower floral glumes shorter than the upper involucrel, hyaline, ciliate, faintly 3-5-nerved, epaleate, male. Joints and pedicels compressed, obliquely truncate, $\frac{1}{2}$ - $\frac{2}{3}$ as long as the sessile spikelets and ciliate with short white hairs on both sides.

Locality : W. Ghats : Castle Rock (Bhude !).

Distribution : So far endemic

35. SCHIZACHYRIUM Nees.

Annual or perennial grasses, rarely suffrutescent, never very tall. Stems slender. Leaf-blades folded in bud, usually narrow. False panicles varying from very loose and scanty to densely fasciated; spathes mostly very narrow, scarious, membranous or lower down herbaceous.

Spikelets 2-nate, of each pair differing in sex and mostly also more or less in shape and size, one sessile, the other pedicelled, on the articulate fragile rachis of many-jointed solitary racemes terminating the culms and their branches, supported by spathes and often collected into a false panicle, the sessile spikelets falling with the contiguous joint and the accompanying pedicelled spikelet; joints and pedicels thickened upwards, often rather stout with a scarious cupuliform and more or less dentate terminal appendage. Sessile spikelets dorsally compressed or sometimes in their lower half almost terete, awned; callus short with a short beard at the very base. Involucrel glumes equal or subequal, lower chartaceous to subcoriaceous, more or less convex or flat on the back with, at least from the middle upwards, sharply inflexed and mostly narrow margins, 2-keeled, the keels running out into teeth or mucros, upper thinner to membranous, narrowly boat-shaped to dorsally flattened, keeled (at least upwards), 1-3-nerved, the delicate margins ciliate. Floral glumes ciliate, hyaline, lower membranous downwards and often purplish, 2-nerved, upper usually 2-fid or 2-dentate, rarely entire, awned, awn from the sinus or continuing the entire valve. Palea 0 or a microscopic hyaline scale. Lodicle 2, minute, glabrous. Stamens 3, rarely 2. Stigmas laterally exerted low down, styles terminal. Grain narrowly linear in outline or tapering upwards, subterete; embryo short. Pedicelled spikelet similar to the sessile, but usually relatively broader and flatter, or more or less reduced and then sometimes quite small. Involucrel glumes more or less membranous, the lower aristulate or mucicous. Floral glumes, if present, hyaline, ciliate, mucous. Species about 50.—Tropics of both hemispheres.

1. SCHIZACHYRIUM BREVIFOLIUM Nees.

Schizachyrium brevifolium Nees Agrost. Bras. 332; Miq. Fl. Ind. Bat. III, 495; Stapf in Fl. Trop. Afr. IX (1917) 187; Haines Bot. Bih. and Or. (1924) 1042.

Andropogon brevifolius Sw. Prodr. Veg. Ind. Occ. (1788) 26, Fl. Ind. Occ. I, 209; Hack. Monogr. Androp. VI (1889) 363 (excl. var. *fragilis*); Duthie Grasses N. W. Ind. (1883) 19, Fodder Grasses N. Ind. (1888) 34; Hook. f. Fl. Brit. Ind. VII (1896) 165.

A. obtusifolius Poir. Encycl. Suppl. I, 583

A. parviflorus Roxb. Fl. Ind. I (1832) 274.

A. tenellus Presl Rel. Haenk. I (1830) 335

A. debilis Kunth Enum. Pl. I (1838) 488.

A. floridus Trin. in Mem. Acad. Petersb., 6 ser. II (1833) 265.

Pollinia brevifolia Spreng. Syst. I (1825) 288.

Etymology : *Brevifolium* means short-leaved.

Description : Annual. Stems weak, up to 60 cm. long, usually ascending from a decumbent base, rarely erect, many-noded, branched from most of the nodes; branches often 2-4-nate and dividing again, very slender to filiform, geniculate, glabrous, the lower internodes usually much compressed. Leaf-blades linear, constricted at the junction with the sheath, the lower and those of the primary branches obtuse or subobtuse or suddenly narrowed to a sharp point, 25-38 mm. long and 2-6.3 mm. wide, the upper and those of the secondary and tertiary branches much narrower and more acute, often glaucescent, smooth except along the margins and the lower side of the midrib, nerves very fine. Ligules membranous, very short, ciliate. Sheaths compressed, the lower keeled, somewhat lax, glabrous, smooth, the uppermost spathe-like; leaves like the spathe of the inflorescence ultimately turning reddish.

Spathes on subcapillary curved or flexuous branchlets, very narrow, acute, reaching to the base of the racemes or slightly exceeding them; racemes borne on filiform upwards clavate peduncles, slender, from less than 12 mm. to slightly over 25 mm. long, 5-11-jointed; joints

2-2.7 mm. long, widening upwards from a slender base, tips 2-dentate, glabrous, smooth; pedicels as long as the joints, very slender and only slightly thickened upwards. Sessile spikelets linear-lanceolate, acuminate, more or less convex on the back, pale green, about 3.3 mm. long including the minute callus, which is more or less shortly bearded, at least on the sides. Involucral glumes equal, lower thinly chartaceous, 2-dentate, scaberulous along the keels, with very fine intracardinal nerves, smooth or very minutely scaberulous on the back, upper boat-shaped, acute, 1-nerved, ciliate. Lower floral glume elliptic, obtuse, hyaline, nerveless, ciliate, upper 2-fid almost to the base, 1.6 mm. long, segments linear-oblong, subobtuse, sparingly ciliate, awn 8.5-12.7 mm. long. Anthers 0.5 mm. long, deep red or purple. Grain sublinear, tapering upwards. Pedicelled spikelet reduced to a minute glume, often passing indistinctly into the pedicel and produced into a bristle-like awn, about 4.2 mm. long.

Locality : *S. M. Country*. Badami (Talbot 2930 !)

Ecology : A very delicate species, growing in pasture land amongst hills.

Distribution : Widely distributed throughout the tropics

36. ANDROPOGON LINN.

After the restoration of Hackel's subgenera to the rank of genera, the general characters of *Andropogon* itself must be modified in many ways

Mostly perennial grasses of various habit. Spikelets 2-nate, the sessile and pedicelled differing from one another in sex and more or less heteromorphous, all pairs similar, or if the lowest sessile spikelet male or imperfect then resembling the others. Spikes (spiciform racemes) many-jointed, fragile, paired (very rarely solitary) or corymbose (digitate or subdigitate) on terminal peduncles, embraced below by a spathe-like leaf (spatheole), frequently 2 or more pairs with their spathes subtended by a common spathe and so on to more composite branching, the whole forming a false panicle; the sessile spikelets falling with the contiguous joint and the accompanying pedicel, joints and pedicels filiform or thickened upwards and then the tips frequently more or less cupular or auricled. Sessile spikelets dorsally or laterally compressed, nearly always awned, callus short, mostly quite obtuse, shortly bearded. Involucral glumes equal or subequal, subcoriaceous to membranous, lower flat or concave or channelled on the back with at least from the middle upwards sharply inflexed margins, 2-keeled, upper more or less boat-shaped, keeled upwards, 3-1-nerved, sometimes aristulate. Floral glumes ciliate or ciliate, rarely glabrous, lower hyaline, 2-nerved, upper 2-fid or 2-dentate, hyaline or firmer and sometimes subspitiform below the insertion of the awn. Palea a hyaline nerveless scale or 0. Lodicules 2, minute, glabrous. Stamens 3. Stigmas laterally exserted; styles terminal. Grain narrowly lanceolate to oblong in outline, subterete to plano-convex; embryo about half the length of the grain. Pedicelled spikelets often very different from the sessile in shape and less so in size, always more or less compressed dorsally, never concave or channelled on the back, sometimes reduced and then often small or quite suppressed. Involucral glumes herbaceous-chartaceous to membranous, the lower mucous or very rarely aristulate. Floral glumes, if present, hyaline, ciliate, mucous

Species about 100—Mostly in the tropics of both hemispheres.

1. ANDROPOGON PUMILUS Roxb.

PLATE 65.

Andropogon pumilus Roxb. Fl. Ind. I (1832) 273, Steud. Syn. Pl. Glum. (1855) 388, Hook. f. Fl. Brit. Ind. (1896) VII, 170; Cooke Fl. Bomb. II (1908) 976; Haines Bot. Bih. and Or. (1924) 1044.

A. demissus Steud. l.o.

A. pachyarthrus Hack. Monogr. Androp. (1889) 449; Duthie Grasses N. W. Ind. (1883) 21, Fodder Grasses N. Ind. (1888) t 39.

Vernacular names : Zinzvo, Baerki, Gondwal, Lalgavat, Tambrut, Gondal, Chuman chara, Malakava.

Etymology : *Andropogon* is derived from *aner*, *andros*, a man, and *pogon*, beard, i.e., man's beard, alluding to the appearance of the spikes.

Description : Annual; stem 15-45 cm. high, slender, suberect or geniculate and decumbent below, quite glabrous. Nodes glabrous. Leaves 7.5-12.5 cm. by 2.5-4 mm., linear, finely acuminate, glabrous; sheaths compressed, keeled, quite glabrous; ligule short, truncate, membranous, glabrous.

Racemes 1.3-2 cm. long, in nearly equal pairs on a very slender peduncle which arises from a narrow flattened glabrous spathe 6-13 mm. long, joints 2.5 mm. long, very slightly

clavate (almost linear), flattened, glabrous and often red on the back, with densely ciliate margins and a cup-shaped 2-3-toothed apex. Sessile spikelets reaching 5 mm. long; callus glabrous. Glumes 4; lower involucre glume 5 mm. long, linear-lanceolate, acuminate, membranous, 2-cuspidate, the keels strong, running into the slender awns about 0.8 mm. long; upper involucre glume as long as the lower, narrowly lanceolate, mucronate, coriaceous, 1-nerved, lower floral glume hardly 3 mm. long, linear-lanceolate, subacute, hyaline; upper floral glume 2.5 mm. long, narrowly linear, hyaline, cleft at the apex into 2 subulate lobes with an awn in the sinus between them, awn reaching 16 mm. long, geniculate about the middle; the lower half brown, the upper white. Anthers 2 mm. long. Pedicellate spikelets not awned; pedicels 3 mm. long with ciliate margins. Glumes 3; lower involucre glume 4 mm. long, ovate-lanceolate, acuminate, 5-nerved.

Locality: Gujarat Nadiad farm (Herb Econ. Bot. Poona 1); Surat (Dalzell).
 Khandesh: Bhusawal (McCann 5451 1), Bor, Bori River (Blatter and Hallberg 5116 1), to Naradana (Blatter and Hallberg 5207 1).
 W. Ghats Panchgani (Blatter and Hallberg B1268 1 B1274 1 B1326 1).
 Deccan: Pashan (Gammie 1), Bairawadi, Purandhar (McCann 5064 1);
 Manmad (Blatter A262 1), Shinda (Sabnis A263 1).
 S. M. Country: Haveri (Talbot 2230 1); Dumbai (Talbot 2318 1); Harsol (Sedgwick 1083 1).

N. Kanara Karwar (Lisboa).

Ecology: A subgregarious species. Common on poor soil of the Mallad tract of the Carnatic. Very common in Poona, according to Lisboa, where large tracts of ground appear red owing to the colour of the bracts. May be found the whole year round.

Distribution: Nepal, Bihar, Rajputana, Central Provinces, W. Peninsula.

Economic uses: Considered to be a good fodder especially before the flowering time. Duthie says that it is good for cattle but not for horses.

Explanation of Plate 65: *Andropogon pumilus* Roxb.

- | | |
|-------------------------------------|--------------------|
| 1. Pedicelled and sessile spikelets | } Sessile spikelet |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume. | |
| 6. Stamens, ovary, and styles | |
| 7. Lower portion of spikes. | |

37. CYMBOPOGON Spreng.

Perennial, densely tufted and usually aromatic grasses. Leaves often very coarse.

Panicles frequently much compound and contracted, spatheate. Spikelets 2-nate, those of each pair differing in sex and more or less in shape—except those of the lowest pair of the lower or of both racemes which are homogamous (male or neuter)—one sessile, the other pedicelled on the articulate fragile rachis of many-jointed paired racemes, terminating the culms and their branches; raceme-pairs supported by a spatheole, collected into often decompound or supra-decompound spatheate panicles, the fertile spikelets falling with the contiguous joint and the accompanying pedicel; joints and pedicels filiform or linear with frequently more or less cupular or auricled tips, those of the lowest pair (raceme-base) often conspicuously swollen, oblong or barrel-shaped and hard. Sessile spikelets (above the lowest) female or hermaphrodite, dorsally, rarely laterally, compressed, awned (normally); callus very short, obtuse, shortly bearded. Involucre glumes equal or subequal, more or less chartaceous, lower almost flat or slightly depressed or narrowly grooved on the back, with at least from the middle upwards sharply inflexed margins, 2-keeled, upper more or less boat-shaped, keeled upwards, usually 1-nerved. Floral glumes ciliate or ciliolate (sometimes obscurely), lower entire, hyaline, 2-nerved, upper 2-fid or 2-lobed, hyaline, rarely firmer and almost stipe-like below the insertion of the awn, column of awn, if any, smooth. Palea 0. Lodicules 2, minute, glabrous. Stamens 3. Stigmas laterally exserted; styles terminal. Grain oblong in outline, subterete to plano-convex in cross-section; embryo about half the length of the grain. Pedicelled spikelets usually slightly different in shape and size from the sessile, but never depressed or grooved on the back. Involucre glumes mucous, lower chartaceous to subchartaceous, upper thinner. Lower floral glume hyaline, 2-nerved, upper 0, but usually a male flower present.

Species about 36, in the tropical, more rarely in the subtropical regions of the Old World.



ANDROPOGON PUMILUS ROXB.

Desin: B. K. Bhada



Sessile spikelet

CYMBOPEGON SCHOENANTHUS SPRENG.

Drawn by B. K. Bhide.

Cooke mentions 1 indigenous (*Andropogon Iwarancusa* Jones) and 1 cultivated species (*Andropogon Schoenanthus* Linn.) belonging to this genus. We add another indigenous species and two cultivated ones.

- A. Blades long, hard, rough-edged throughout, filiform to linear, lower involueral glume of sessile spikelet flat or concave between the keels
- I. Raceme-joints villous all over, hairs long, more or less concealing the sessile spikelets, awn usually a straight, very short bristle
1. Basal leaf-sheaths in dense tufts, tightly clasping, thickened below, blades more or less filiform and flexuous, except when very short, raceme-fascicles more or less simple 1 *C. Schoenanthus*.
- 2 Basal leaf-sheaths ultimately loosened and curled, blades flat, raceme-fascicles compound 2. *C. Iwarancusa*.
- II. Raceme-joints bearded along the sides, but hairs not concealing the sessile spikelets, fertile spikelets awnless 3. *C. citratus*.
- B. Blades flat, 5-30 mm wide, rounded to subcordate and stem-clasping at the base of a soft texture, with smooth edges, at least in the lower part, lower involueral glume of sessile spikelet with a narrow groove from the middle downwards corresponding to a keel inside.
- I Blades 10-30 mm. wide (rarely under 10 mm.), somewhat fat, rich green, at least above; panicles 10-30 cm long, turning reddish when mature 4 *C. Martini*.
- II Blades 2-6 mm. wide, thin, glaucous; panicles 10-20 cm. long, glaucous or straw-colour when mature 5. *C. caesus*.

1 CYMBOPOGON SCHOENANTHUS Spreng

PLATE 66.

- Cymbopogon Schoenanthus* Spreng Pug II (1815) 15 (non Schult.), Stapf in Kew Bull. (1906) 303-313, 352-353, in Fl Trop. Afr IX (1919) 268.
- C. arabicus* Nees ex Steud Syn Pl. Glum. I (1855) 387
- C. Arriani* Aitch. Cat. Panj Pl. (1869) 174
- C. circinnatus* Hochst. ex Hack Monogr Androp (1889) 599.
- Andropogon Schoenanthus* Linn Sp. Pl (1753) 1046 (non Hackel et plurimorum auct.).
- A. bicornis* Forsk. Fl Aeg-Arab (1775) 173 (non Linn.).
- A. laniger* Desf. Fl. Atl II (1800) 379; Boiss. Fl. Or V (1881) 465; Balfour Bot. Socotra (1888) 316, Hack Monogr. Androp (1889) 598; Benth in Hook. Ic. Pl. t. 1871.
- A. Olivieri* Boiss Diagn. Pl. Or. ser. I, fasc V (1844) 76.
- A. circinnatus* Hochst et Steud. Syn. Pl. Glum. I (1855) 387.
- A. Arriani* Edgew in Journ. Linn Soc VI (1862) 208
- A. Iwarancusa* subsp. *laniger* Hook. f. Fl. Brit Ind VII (1896) 203; Cooke Fl Bomb. II (1908) 976 (var. *tantum*).

Gymnanthelia lanigera Anders. in Schweinf Beitr. Fl. Aethiop (1867) 306 (nomen tantum). For a discussion of the foundation of this species see Stapf in Kew Bull. (1906) 303-305.

Vernacular names : Khavi, Ghatyari, Iskur (Arabic name of the grass as sold in the bazaars)

Etymology : *Cymbopogon* is derived from *kymbe*, a boat, and *pogon*, a beard—*Schoenanthus* is *schoinu anthos* Hippocrates (460-357 B C) mentions *schoinus* among the aromata, *anthus* means flower

Description : Perennial, compactly caespitose, with numerous intravaginal innovations, 15-45 cm high Culms erect, slender, few- to 4-noded and simple below the inflorescence, terete, glabrous, very rarely with a few small hairs at the nodes Leaf-blades semiterete, filiform, wiry, flexuous, very firm and often acuminate upwards, rounded on the back, channelled on the face, or those of the culms somewhat flatter and shorter, up to more than 23 cm. long, 1 mm in diam, glabrous, finely scaberulous on the nerves below, though often smooth to the touch, pale, glaucous, evenly 7-9-nerved, the midrib showing only above as a broad, white band. Ligules membranous to scarious, oblong, truncate, oboate, up to 3.3 mm. long Sheaths

very firm, smooth, glabrous, tight, those of the innovations and base of the culms widened at the base, very tough and long-persistent, straw-coloured, up to 13 cm long

Spathate panicle narrow, 8-30 cm. long, few- to 7-noded, lower internodes 5-7.5 cm. long, upper rapidly decreasing in length, slender, glabrous; lowest primary branch rarely undivided at the base, 3-2-noded and up to 15 cm long, usually forming up to 4-rayed tiers; lowest subtending sheaths with foliaceous blades, rays finely filiform, 2.5-3.7 cm. long, rarely to over 5 cm., glabrous; spathes narrowly lanceolate, subherbaceous, often tinged with pale purple, with a short blade or the upper bladeless and produced into a setaceous point, 3.7-4.3 cm. long, glabrous. Spatheoles very narrow, acute or with a setaceous point, 12-25 mm. long, pale or straw-coloured; peduncles finely filiform, widened upwards 3.3-4.2 mm. long, tips truncate. Racemes 2-nate, more or less divaricate, at length epinastically deflexed, 1-2 mm long, white-villous, pale or tinged with purple, one sessile, the other with a bare base, 1-2 mm long, bases puberulous to pubescent in the fork, ciliate-bearded upwards, with minutely cupular and denticulate tips, that of the sessile raceme as well as the adjacent pedicel stout, elliptic to elliptic-oblong in outline and convex on the back, ultimately more or less glabrescent and glossy, fertile joints filiform, slightly widened towards the oblique subcupular auricled tips, 2.7-3.3 mm. long, densely hairy to villous from the back and the angles, adjacent pedicels similar to the joints but more slender. Homogamous pair of spikelets 1 at the base of the sessile or of both racemes, the sessile spikelet of the lowest but one of the sessile raceme intermediate and imperfectly awned. Fertile spikelets linear-lanceolate, more or less acuminate, acute, including the callus 5.3-6.3 or even 7.4 mm. long, glabrous, pale green below, reddish upwards, callus short, obtuse, shortly bearded. Involucral glumes equal, chartaceous, lower nerveless and shallowly concave between the acute scaberrulous keels, minutely 2-denticulate, upper lanceolate-oblong in profile, acute, slightly curved on the back, 1-nerved, margins broadly hyaline upwards, ciliate. Lower floral glume linear-oblong, nerveless, hyaline, ciliate, slightly shorter than the involucral glumes, upper very narrow, shortly 2-fid, cuneate-linear and chartaceous below the insertion of the awn, less than 3.3 mm. long, lobes broadly lanceolate, ciliate, awn up to 1 cm. long, very fine, more or less keeled at and slightly twisted below the middle; column smooth. Anthers 2 mm. long. Pedicelled spikelets male, linear-oblong, 4.2-6.3 mm. long, glabrous, more reddish than the sessile; involucral glumes subchartaceous, with 5-9 evenly distant intracardinal nerves, the upper thinner, 3-nerved; lower floral glume linear-oblong, sub-2-nerved, ciliate, 4-2 mm. long, upper floret reduced to a male flower, or its glume present as a microscopic scale

Locality : *Sind* (Stocks 816, Woodrow), Jemadar ka Landa, near Karachi (Stocks).

Ecology : This is a characteristic desert plant requiring very little water.

Distribution : From Morocco through N Africa, Arabia, Persia, Afghanistan, Baluchistan, Punjab, Sind.

Economic uses : Eaten by cattle, especially when young.

On oil and other products of this plant see Stapf in Kew Bull. (1906) 305-313, and Gilde-meister and Hoffmann : Die athenischen Oele. 1899, and in translation : Kremers, The Volatile Oils, Milwaukee, 1890

Explanation of Plate 66 : *Cymbopogon Schoenanthus* Spreng.

- | | |
|---|---------------------|
| 1. Pedicelled and sessile spikelets | } Sessile spikelet. |
| 2. Lateral view of upper invol glume. | |
| 3 Lower invol glume | |
| 4. Upper invol. glume. | |
| 5. Lower floral glume. | |
| 6. Upper floral glume | |
| 7 Stamens, ovary, styles and lodicules. | |

2. CYMBOPOGON JWARANCUSA Schult.

PLATE 67.

Cymbopogon Jwarancusa Schult. Mant. II (1824) 458; Stapf in Kew Bull. (1906) 354; Haines Bot. Bih. and Or. (1924) 1045.

Andropogon Jwarancusa Jones in Asiat Research, IV. (1795) 109; Cooke Fl. Bomb. II (1908) 976.

A. Jwarancusa var. *genuinus* Hack. Monogr. Androp. (1889) 599.

A. Jwarancusa subsp. *Jwarancusa* proper Hook. f. Fl. Brit. Ind. VII (1896) 203.

A. laniger Duthie Fodder Grasses N. Ind. (1888) t. 23.

Vernacular names : Jwarankusa, Khavi.

Etymology : *Jwarancusa* means fever-restrainer and is composed of *Jwara*, fever and *ankusa*, the hook used by the elephant-driver to restrain his elephant.



Sessile spikelet

CYMBOPOGON JWARANCUSA SCHULT.

Desm. : B. K. Bhida.

Description : Usually a tall grass, up to 1.8 m. high, with very aromatic roots, densely tufted, the stems from clusters of firm, persistent, finally loose and open and tortuous leaf-sheaths, more or less widened below. Leaves flat, up to 60 cm. long and 5 mm. broad, narrowly linear, filiform above and ending in a long capillary tip, ligule 0.5 mm. long, membranous.

Panicles long, narrow, interrupted, with very compressed, short, fascicled branches bearing spathes about 5 cm. long and spatheoles 6-18 mm long. Racemes 1.4-1.8 cm. long, often 5-jointed, joints half as long as the uppermost villi. Spikelets 3-4 pairs, green, half hidden by the 5 mm. long villi on the joints and pedicels. Sessile spikelets 5 mm. long, lower involucre flat or concave between the keels, which are neither winged nor margined (omitting, of course, the ordinary inflexed margins of the glume common to the genus) or sometimes narrowly margined, scabrid or ciliate, nerves 2-4 or 0 between the keels. Joints of rachis and pedicels subclavate, with toothed tips. Pedicelled spikelets equal or rather longer than the sessile, narrowly lanceolate, purplish, lower involucre glume 7-9-nerved.

NOTE—This species is nearly related to *C. Schoenanthus* and the two, as pointed out by Hackel (l. c. p. 600), are not always distinguishable with certainty. "At high altitudes," says Stapf (l. c. 314), "as in Kumaon and Spiti, or in the dryer parts of the Punjab, it (*C. Javanicus*) becomes dwarfed and narrow-leaved and forms a 'transition state' to *C. Schoenanthus*. The latter is a characteristic desert plant, able to exist with a minimum supply of water. On the other hand, *C. Javanicus* is dependent on an, at least temporarily, abundant supply of water, and prefers the neighbourhood of rivers, or actually grows in the beds of torrents. It is not impossible, that the distinguishing characters of *C. Javanicus* as compared with *C. Schoenanthus*, that is the robust state, the long, flat and relatively broad leaves, and the more composite panicles, are mainly due to ecologic conditions."

Locality : Sind · Karachi (Dalzell & Gibson); Bholari (Bhide !), Shikarpur (Bhide !); Umarnot, sandy plains (Sabnis B1082 !), Gharo (Blatter & McCann D669 ! D670 !); Ghulamalla (Blatter & McCann D671 !).

Gujarat : Ahmedabad (Dalzell & Gibson)

Distribution : Outer hill-zone of the United Provinces, Kumaon, Garhwal (up to 10,000 ft. or over) and westwards as far as Peshawar, Jodhpur and Jaisalmer States, Sind, Bihar.

Economic uses : This grass is probably used for oil along with the previous species.

Explanation of Plate 67 : *Cymbopogon Javanicus* Schult.

- | | |
|--|--------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume. | |
| 6. Stamens, ovary, styles and lodicules. | |

*3. CYMBOGON CITRATUS Stapf.

Cymbopogon citratus Stapf in Kew Bull. (1906) 357, in Fl. Trop. Afr. IX (1919) 282.

Andropogon Schoenanthus Linn. Syst. ed. X (1759) 1304, not of Sp. Pl.; Roxb. Fl. Ind. I (1832) 274.

A. citratus DC. Cat. Hort. Monsp. (1813) 78; Nees in Allgem. Gartenz. III (1835) 266.

A. citrodorum (sic !) Desf. in Tabl. Écolé Bot. II (1815) 15.

A. Roxburghii Nees in Wight Cat (1833) no. 1699 (*nomen tantum*); Steud. Syn. Pl. Glum. I (1855) 395.

A. ceriferus Hack. in Mart. Fl. Bras. II, pt. III (1883) 281.

A. nardus var. *ceriferus* Hack. Monogr. Androp. (1889) 605.

Schoenanthus amboinicum Rumph. Herb. Ambom. V, 181, t. 72.

For the taxonomic position of this species see Stapf in Kew Bull. (1906) 330-333.

Vernacular names : Oleu cha, Hirva cha, Lih cha, Vassane-hullu, Kavance hullu, Majjige hullu, Lemon Grass.

Description : A tall perennial, throwing up dense fascicles of leaves from a short, oblique, annulate, sparingly branched rhizome, usually barren, but occasionally giving rise to a stout erect culm up to over 1.8 m. high, 7-8-noded and simple below the panicle. Leaf-blades linear, long-attenuated towards the base and tapering upwards to a long setaceous point, up to over 90 cm. long by 16-18 mm. wide, very firm, glaucous-green, glabrous, smooth or more or less rough upwards and along the margins; midrib somewhat stout below, whitish on the upper side, primary lateral nerves 4-6 on each side, raised particularly above with 2-4 secondary nerves between them. Ligules very short, scarious, rounded or truncate. Sheaths terete, those of the barren shoots much widened at the base, and tightly clasping each other, narrow and separating upwards, with rounded shoulders at the mouth, 10-30 cm. long, subcoriaceous, quite glabrous and smooth, more or less cinnamon-coloured or russet on the inside, sheaths of the culms tight, shorter than the internodes, finely pubescent or velvety at the nodes.

Spathate panicle decompound to subdecompound, loose, 30 to over 60 cm. long, nodding; internodes 4 to over 6, the longest up to 20 or 22 cm. long, rapidly decreasing in length upwards; lowest primary branches undivided at the base, up to over 45 cm. long, and up to 5- or 6-noded, the following forming mixt tiers of very unequal variously compound and simple rays, ultimate tiers up to 4-rayed; rays filiform and glabrous, spathes narrow-lanceolate, acute or acuminate, 2.5-5 cm. long, with narrow membranous margins. Spathaeoles very narrow, linear-lanceolate to almost subulate when unrolled, 14-18 mm. long, acute or finely acuminate, reddish to rich russet. Peduncles 6-10 mm. long, glabrous. Racemes 2-nate, finally spreading at right angles or epimastically deflexed, moderately dense, 14-25 mm. long, pale, variously tinged with dull purple, loosely villous, one sessile, the other with a slender filiform bare base, almost 2 mm. long and hairy, the pedicel of the homogamous pair also slender, though short; fertile joints filiform, slender, 2-3 mm. long, ciliate on both sides, tips obliquely auriculate and cupular; adjacent pedicels very similar. Homogamous pair of spikelets 1 at the base of the sessile raceme, its sessile member usually slightly differing in shape from the fertile spikelets. Fertile spikelets linear to linear-lanceolate, acutely acuminate, 5-6 mm. long, reddish, glabrous; callus short, obtuse, minutely bearded. Involucral glumes subequal, lower subchartaceous, slightly depressed towards the base, otherwise flat on the back, keels acute, scaberrulous above, intracardinal nerves 0 or 1, short or indistinct, upper boat-shaped, slightly curved on the back, acute, keeled upwards. Lower floral glume hyaline, linear oblong or almost linear, sub-2-nerved, ciliate above, slightly shorter than the involucral glumes, upper narrowly linear, acute, about 4 mm. long, usually entire and awnless, rarely more or less 2-fid with a small bristle from the sinus. Anthers 2 mm. long. Pedicelled spikelets male or neuter, linear to subulate-lanceolate, as long as the sessile, reddish, glabrous, lower involucral glume 5-9-nerved, upper 3-nerved, lower floral glume shorter to much shorter than the involucral glumes, hyaline, ciliate, upper very narrowly linear, nerveless if present at all.

Locality: Gardens in Bombay.

Distribution: This grass is only known in the cultivated state. Probably of Indian origin, and now widely distributed over the tropics of both hemispheres. See Stapf in Kew Bull. (1906) 334.

History and uses: See Stapf in Kew Bull. (1906) 322-330, 334 and authorities given under *Cymbopogon Schoenanthus*.

1. CYMBOPOGON MARTINI Stapf.

Cymbopogon Martini Stapf in Kew Bull. (1906) 359; Haines Bot. Bih. and Or. (1924) 1046.

C. Martinianus Schult. Mant. II (1824) 459.

Andropogon Martini Roxb. Fl. Ind. I (1820) 280.

A. pachnodes Trin. in Mem. Acad. Petersb. ser. 6, II (1833) 284, and Spec. Gram. Ic. (1836) tab. 327.

A. Calamus aromaticus Royle, Essay Antiq. Hind. Med. (1837) 33 (*nomen tantum*), Illustr. Bot. Himal. (1840) tab. 280.

A. nardodes Nees Fl. Afr. Austr. (1844) 116.

A. Schoenanthus Fluck. & Hanb. Pharmacogr. (1874) 660 (*non* Linn.).

A. Schoenanthus var. *genuinus* Hack. Monogr. Androp. (1889) 609 (*partim*).

A. Schoenanthus var. *Martini* Hook. f. in Fl. Brit. Ind. VII (1896) 204 (*exclus. synonym. referentibus ad plantas Africanas*).

For the foundation of this species and its synonymy see Stapf in Kew Bull. (1906) 335-337.

Vernacular names: Geranum grass, Rusa grass, Rohisha, Rosem, Rusa, Gandh-bel, Murchia gandh, Tikhari, Rohish, Roshegavat, Rhonse, Rauns, Eunthi hullu, Khasi hallu.

Description: A tall, perennial, sweet-scented grass 1.5-2.4 m. high. Stems glabrous, straw-coloured, leafy. Leaves flat, usually broad, rounded or subcordate at the base, more or less glaucous beneath, those below the inflorescence rarely under 23 cm. long by 1 cm. wide at the base, but often 2.5 cm. wide below, tapering from a little above the base or from the middle to a firm tip, glabrous except for the scabrid margins, margins sometimes smooth near the base.

Spikes 2-nate, 12-18 mm. long, oblique or divaricate or less often deflexed. Peduncle about half the length of the 18-25 mm. long spatheole, several spatheoles and their peduncles from a spathe of a lower order, these arranged in long usually narrowly oblong panicles not more than 3.5-5 cm. wide, but sometimes panicle with many branches and broader. Joints and pedicels slenderly clavate (excluding the much thickened lowest), about half as long as the sessile spikelets, tips with a lanceolate tooth or 3-toothed, margins long-villous 3.5-5 mm. long. Lower involucral glume (above the lowest spikelet) with lanceolate centre becoming

oblanceolate or oblong from the keels being membranously winged above the middle, back with a vertical median depression below the middle corresponding to a ridge inside, upper cymbiform with the dorsal keel winged above, minutely ciliate below.

Locality : *Cutch* · Bhuj, Rhodir-Maka (Blatter 3749 !); Anjar (Blatter 3741 !)
Kathrawar · Junagad (Blatter 3783 !)
Gujarat · Champanir (Chibber !); Ahmedabad, dry hills (Sedgwick 310 !)
Khandesh · Road to Chinchpada (Chibber !); Toranmal (McCann A235 !).
Konkan · Wada Range (Ryan 488 !), Gokhirva, Bassein (Ryan 41 !); Keltan (Ryan 392 !); St. Xavier's College compound (McCann 4461 !).
W. Ghats · Igatpuri (Blatter & Hallberg 4432 !), Kasara, Igatpuri Ghat (McCann 4343A !); Khandala, very common (McCann !), Panchgani (Blatter & Hallberg B1248 ! B1282 ! B1297 ! B1324 !).
Deccan · Ganeshkhind Botanic Gardens (Garade 435 !); Purandhar (McCann 5010 !), Pashan (Gammie !); Modasa (Sedgwick & Saxton !).
S. M. Country · Haveri (Talbot 2180 !), Dharwar (Talbot 2616 !); Badami (Talbot 2928!).

Stapf excludes also the outer slopes of the Western Ghats, but the localities given above show that the grass is well represented in that region

Ecology : According to Malcolmson "the Rusa grass in the Deccan affects particularly the trap, more or less avoiding the granite, so much so that he was able to trace the green-stone dykes across the granite by the luxuriance of the grass." (ex Stapf).

This species frequently occupies large areas of open grass-land often to the exclusion of everything else. It is often densely tufted. During the rains growth is enormous, the plant often exceeding the height of a man. At this period the plant develops large broad leaves which are strongly aromatic when crushed. The monsoon form with broad leaves dies down during the dry months and a fresh crop of culms appears in dense tufts which do not attain the same dimensions. The leaves are often very narrow with the margins often recurved during the hottest part of the day. Frequently the monsoon crop is destroyed by fire and soon after a fresh crop appears which is typically the hot weather form.

Distribution : From the Afghan frontier to the Rajmahal Hills in Bengal and from the subtropical zone of the Himalaya to about 12° N., excluding the desert region of the Punjab and the greater part of the northern Carnatic.

History and uses : The Russa grass oil (*Oleum Palmarosae seu Gerani Indici*, Palmarosa oil) is produced from this plant. See Stapf in Kew Bull. (1906) 338-341.

5 CYMBOPOGON CAESIUS Stapf.

Cymbopogon caesus Stapf in Kew Bull. (1906) 360, in Fl. Trop. Afr. IX (1919) 287.

Andropogon caesus Nees in Wight Cat. (1833) nos. 1700b (*nomen tantum*) and in Hook. & Arn. Bot. Beech. Voy. 244 *cum descriptione (partim)*.

A. Schoenanthus var. *caesus* Hack. in Monogr. Androp. (1889) 610; Schweinf. in Bull. Herb. Boiss. II, App. II, 14, Hook. f. Fl. Brit. Ind. VII (1896) 205, *exclus fere omnibus synonym*. For foundation of this species see Stapf in Kew Bull. (1906) 344.

Etymology : *Caesus* means bluish grey.

Description : A perennial, tufted grass, up to 1 m. high, with intra- and extravaginal innovation-shoots from a short rhizome. Culms erect or geniculate-ascending, slender, more or less wiry, frequently branched below, the branches often in fascicles from the knees, often many-noded, terete, glabrous, smooth. Leaf-blades linear from a scarcely narrowed rarely slightly rounded base, tapering to a long setaceous point, those of the culms up to over 15 (sometimes almost 30) cm. long, 2-6 (sometimes 10) mm. broad, of the innovations usually much shorter, flat, bluish-glaucous, glabrous, smooth, midrib slender, primary lateral nerves very fine, 3-4 on each side. Ligules very short, rounded, scarious. Sheaths rather firm, tight, the lowest mostly short, those placed at branching nodes at length thrown aside, inrolling or deciduous, glabrous, smooth, usually much shorter than the internodes.

Spathaceous panicle narrow, mostly 7-15 cm. long, rarely much longer, sometimes reduced and small, dense or interrupted; internodes usually 4-6, the lowest rarely exceeding a third of the panicle, the following gradually decreasing; lowest primary branch shortly exerted from its sheath, undivided at the base, or like the following forming mixed or (upwards) simple-rayed tiers, rays of ultimate tiers 5-3, finely filiform, 6-8 mm. long, glabrous; lowest subtending sheaths with foliaceous blades; spathes lanceolate, acuminate, 2.5-2 cm. long, subherbaceous, glaucous, sometimes turning reddish. Spatheoles narrowly lanceolate, acuminate, 14-16 mm. long, subherbaceous to scarious, turning dirty straw-colour or slightly reddish; peduncles filiform, 5-6 mm. long, glabrous. Racemes 2-nate, obliquely erect, 12-14 mm. long, greenish, more or less white-villous, one subsessile, the other with a bare base, over 2 mm. long, finely

pubescent on the inner side, ciliate and thickened upwards, base of the subsessile raceme swollen, hard, fused with the equally swollen and hard adjacent pedicel; fertile joints filiform, about 2 mm. long, glabrous on the back, densely ciliate on the sides, cilia snow-white, tips often cupular with a crenulate margin or auricle; adjacent pedicels very similar. Homogamous pair 1 at the base of the sessile raceme. Fertile spikelets oblong, slightly wider above the middle, subobtusely, 4 mm. long, greenish, glabrous, callus very small, obtuse, minutely bearded. Involucral glumes equal, subchartaceous, lower minutely truncate, flat on the back with a fine median groove in the lower half, keels narrowly winged from the middle upwards, intracardinal nerves 1 on each side towards the keels, very fine, upper narrow in profile, very acute, very narrowly winged above the middle, with 1 delicate nerve on each side near the margin. Lower floral glume delicate, oblong, minutely truncate, ciliate, nerveless, upper substipitate, almost 3 mm. long, 2-fid to the middle, segments subulate, ciliate, awn very fine, 10-14 mm. long, bent at and twisted below the middle. Anthers almost 2 mm. long. Pedicelled spikelets male, linear to lanceolate-oblong, subobtusely, 4 mm. long, green, glabrous; lower involucral glume slightly convex on the back, subherbaceous, about 10-nerved, the inner 6 nerves prominent, upper subhyaline, 3-nerved; floral glume oblong, truncate, sub-2-nerved, almost 4 mm. long.

Locality : Gujarat. On sandy and gravelly hills and banks, Ahmedabad and Prantij.

Distribution : Throughout the Carnatic, Gujarat, Arabia, Somaliland.

History and uses : See Stapf Kew Bull. (1906) 342-345.

38. HETEROPOGON Pers.

Perennial or annual grasses, with simple or more often upwards branched culms, branches few to many, mostly flowering and gathered into a spatheate panicle.

Racemes conspicuously dorsiventral, the bases of the male (or neuter) spikelets subimbricate on the back of the raceme, their upper parts bending forward around the sides, forming a hollow in which the fertile spikelets are enclosed, with their awns exerted anticously and often intertwisted. Spikelets 2-nate, those of the lower (1 to many) pairs alike in sex and shape, male or neuter, of the upper pairs differing in sex and shape, one of each pair sessile, the other pedicelled on the many-jointed rhachis of solitary racemes, terminating the culms and their upper branches, rhachis tough or upwards tardily disarticulating and glabrous between the homogamous pairs, readily disarticulating above them, homogamous pairs long-persistent, the spikelets of the heterogamous pairs falling separately, the pedicelled with the pedicel, the sessile with the adjacent joint and the adjacent pedicel or its base. Sessile spikelets subcylindric, awned, callus long, pungent, densely bearded upwards. Involucral glumes equal, the lower coriaceous, rarely chartaceous, more or less tightly involute, quite keelless, nerves obscure, often connected by few transverse nerves in the upper part; upper with a deep longitudinal groove on each side, coriaceous, rarely chartaceous, between them, thinner towards the margins, membranous at the tips, 3-nerved. Lower floral glume hyaline, nerveless, upper stipitate from a hyaline very slender base, cartilaginous upwards and passing into a usually stout geniculate awn. Palea small or absent. Lodicules large or more or less reduced, to very minute. Stamens 3, often rudimentary or absent. Stigmas exerted terminally or laterally. Grain more or less linear in outline, subterete, slightly dorsally compressed; embryo somewhat exceeding the middle of the grain. Pedicelled spikelets male or neuter, dorsally flattened, usually slightly asymmetric, and often somewhat twisted, muticous, imbricate. Lower involucral glume herbaceous, many-nerved, winged upwards from one or both keels, upper membranous, lanceolate-oblong, acute, 3-nerved. Floral glumes hyaline, 1-nerved, well-developed or more or less reduced. Stamens 3 or 0.

Species about 6—Tropical and subtropical regions of the whole world.

Cooke describes 4 species under *Andropogon*, viz., *A. polystachyos* Roxb., *A. triticeus* R. Br., *A. Richies* Hook. f. and *A. contortus* Linn. We transfer these to *Heteropogon* and add *Heteropogon oliganthus* Blatter & McCann.

A. Not more than 30 cm. high.

I. Upper involucral glume of pedicelled spikelet 1-3-nerved 1. *H. oliganthus*.

II. Upper involucral glume of pedicelled spikelet 5-nerved 2. *H. polystachyos*.

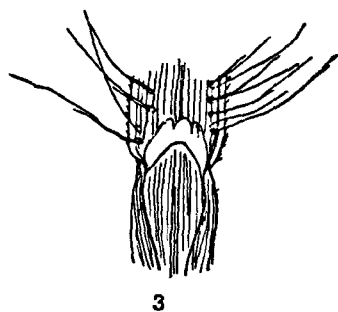
B. More than 40 cm. high.

I. Lower involucral glume dorsally deeply grooved 3. *H. insignis*.

II. Lower involucral glume not dorsally grooved.

1. Ligule of several narrow membranous segments 4. *H. Richies*.

2. Ligule truncate, ciliate 5. *H. contortus*.



Sessile spikelet



HETEROPOGON OLIGANTHUS BLATTER & McCANN.

Desm: B. K. Bhid.

1. *HETEROPOGON OLIGANTHUS* Blatter & McCann.

PLATE 68

Heteropogon oliganthus Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 623

Andropogon oliganthus Hochst ex Steud. Syn. Pl. Glum. (1855) 368, Hack Monogr. Androp. (1889) 591, Hook. f. Fl. Brit. Ind. VII (1896) 202.

Etymology : *Heteropogon* is derived from *heteros*, different, and *pogon*, beard, alluding to the pedicelled spikelets which are quite unlike the sessile.—*Oliganthus* is derived from *oligos*, few, and *anthos*, flower.

Description : A dwarf annual. Stems 7-15 cm. high, tufted, slender, sometimes creeping below, geniculate. Leaves 5-7.5 cm. long, quite flat, subensiform, acuminate, softly hairy, margins thickened, cartilaginous, sheaths compressed, ligule very short, membranous.

Spikes usually very shortly exerted from the long, narrow, glabrous spathes, peduncle curved, puberulous. Spikes 8-16 mm long, with 3-6 pairs of glumes, lower spikelets neuter. Joints and pedicels about half as long as the sessile spikelet, long ciliate. Sessile spikelet 5 mm. long, oblong, callus short, obtuse. Lower involucral glume obtuse, chartaceous, dorsally villous toward the base, not dorsally channelled, shining, faintly nerved, with narrowly involute margins, ciliate towards the truncate tip, callus bearded, upper involucral glume obtuse, apiculate. Lower floral glume very short, broadly oblong, ciliate, upper with a shining awn 3-4 cm. long, column of awn glabrous. Palea very small. Anthers 1 mm. long. Pedicelled spikelet neuter, larger than the sessile, ovate-oblong. Lower involucral glume herbaceous, obovate-oblong, truncate, distinctly 9-13-nerved, subemarginate, keels scabrous, margins ciliate, hardly incurved, upper shorter by $\frac{1}{2}$, membranous, oblong, obtuse, 1-3-nerved, ciliate. Palea of upper floral glume very small.

Hackel, l. c., is of opinion that this species is intermediate between *Dichanthum* and *Heteropogon*, but comes nearer the *Heteropogons*, because the sessile spikelets differ from the pedicelled ones in shape, nervation and the dorsal furrow.

Locality : W. Ghats Mahableshwar, open edge above the precipices looking from Dhobi's Waterfall path to Elphinstone Point, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4608 !); Panchgani (Blatter & Hallberg B1221 !, McCann !).

Deccan Kalsubai (Patwardan !)

Ecology : Purely a monsoon plant, coming into flower in late September and early October. A very aromatic species; the air on the Tableland at Panchgani is impregnated with its odour at the time when it appears. The odour is completely lost in dry material.

Distribution : Nilgiris.

Explanation of Plate 68 : *Heteropogon oliganthus* Blatter & McCann.

- | | | |
|--------------------------------|---|----------------------|
| 1. Lower invol glume. | } | Pedicelled spikelet. |
| 2. Upper invol glume | | |
| 3. Ligule | | |
| 4. Spikelet with pedicel | | |
| 5. Spikelet | } | Sessile spikelet. |
| 6. Lower invol glume | | |
| 7. Upper invol. glume | | |
| 8. Lower floral glume | | |
| 9. Upper floral glume. | | |
| 10. Stamens, grain and styles. | | |

2. *HETEROPOGON POLYSTACHYOS* Blatter & McCann.

Heteropogon polystachyos Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 623.

Andropogon polystachyos Roxb Fl. Ind. I (1832) 261; Steud. Syn. Pl. Glum. (1855) 367; Hook. f. Fl. Brit. Ind. VII (1896) 989, Dalz. & Gibs. Bomb. Fl. (1861) 301; Cooke Fl. Bomb. II (1908) 989.

Description : A dwarf erect grass 15-25 cm. high; stems slender, leafy above, corymbosely branched. Leaves 5-10 cm. by 1.2-1.6 mm, the lower flat, the upper convolute, erect, hairy on both sides with long slender hairs, the margins thickened, sheaths hairy, ligule a short ciliate membrane.

Racemes solitary, 1.3-2.5 cm. long, on very slender peduncles 5-10 cm. long, with a very slender sheath and a small leaf about the middle, the 5 or 6 lower pairs of spikelets neuter; joints 2 mm long, terete. Sessile female spikelets dark brown, 5 mm. long, callus bearded on one side with brown hairs, lower involucral glume oblong when opened out, obtuse, with membranous tip and infolded margins, 7-9-nerved, pubescent on the back; upper involucral glume linear-oblong with a coriaceous centre and broad hyaline margins; lower floral glume shorter, oblong, ciliate; upper floral glume represented by the acute base of the awn; awn

3.8-5 cm. long, hairy. Pedicellate spikelets 6 mm. long; pedicels 1.2 mm. long, glabrous; lower involucre glume with a coriaceous many-nerved centre and broad hyaline wings; upper involucre glume lanceolate, ciliate, 5-nerved. Neuter spikelets lower involucre glume like the pedicellate but broader, 2-toothed at the tip

Locality : *W. Ghats :* Khandala (Woodrow); Mahableshwar, western side of hill (Dalzell & Gibson). We have not seen this species.

Distribution : Peninsular India.

3. HETEROPOGON INSIGNIS Thw.

PLATE 69

Heteropogon insignis Thw Enum Pl. Zeyl. (1864) 437; Benth. Fl. Austral. VII (1778) 517.

Andropogon triticeus R. Br. Prodr (1810) 201, Hack Monogr. Androp. (1889) 588, Steud. Syn. Pl. Glum (1855) 368, Hook f Fl Brt Ind. VII (1896) 200; Cooke Fl. Bomb. II (1908) 989.

A. ischyranthus et hananthus Steud. l. c 367.

Vernacular names : Bhale kusal, Kal kusal, Mothi kusal, Patang.

Etymology : *Insignis* means important, alluding very likely to the tall stout stem.

Description : Perennial, roots of very stout tortuous fibres; stem 1.2-2.4 m. high, as thick as a swan's quill below, hard, smooth, polished, leafy, simple or branched below. Leaves 30-60 cm. by 6-20 mm., narrowly linear, acuminate, glaucous, sparsely hairy, margins scabrous; sheaths compressed, keeled, smooth, ligule a rounded scarcely ciliate membrane.

Racemes 7.5-15 cm long, rachis mariculate except the 4-6 upper nodes, glabrous; spikelets very many, all, except the few terminal, closely imbricating, subsecund, awnless, male or neuter with a short glabrous callus. Upper sessile spikelets long-awned, 8 mm. long; callus long, acute, densely bearded with dark brown hairs; lower involucre glume linear-oblong, subterete, rigidly coriaceous, with an obtuse rounded membranous ciliate tip, dorsally deeply grooved, the margins involute, not winged, upper involucre glume slightly longer than the lower, linear, subterete, rigidly coriaceous, scaberulous, with pale sigmoidly incurved chartaceous margins, obtuse, with membranous truncate or minutely 3-toothed tip; lower floral glume short, oblong, truncate, hyaline, nerveless; upper floral glume represented by the flattened white base of the awn, awn very stout, hirsute, 5-7.5 cm. long. Upper pedicellate spikelets reaching 2 cm long, neuter, pedicels very short, subclavate, glabrous; lower involucre glume more or less twisted, lanceolate, acuminate, many-nerved; upper involucre glume rather shorter than the lower, linear-lanceolate, acuminate, ciliate, chartaceous, 3-nerved; lower floral glume shorter than the involucre glumes, lanceolate, acuminate, ciliate; upper floral glume narrowly oblanceolate, 1-nerved, ciliate near the apex. Lower spikelets 1.3-2 cm. long, neuter or male, like the pedicellate ones.

Locality : *Konkan :* Above Kanari Caves (McCann 9634 !)

W. Ghats : Khandala, very common on open hillside composed of rock fragments (McCann 9425 !), Igatpuri (McCann 4338 !)

Deccan : Around Vital Hills, Poona (Bhude 782 !); Chatterahinj Hill, Poona (Ezekiel !); Mawal, Poona Dist. (Woodrow).

S. M. Country : Manoh (Talbot 3978 !).

N. Kanara : Anmod, bare hillsides, 2,000 ft, rainfall 200 in. (Sedgwick 3324 !).

Distribution : Burma, Central Provinces, W Peninsula, Ceylon, Malaya, Australia.

Explanation of Plate 69 : *Heteropogon insignis* Thw.

- | | |
|-------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets | } Sessile spikelet. |
| 2. Lower invol. glume | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Upper floral glume. | |
| 6. Ovary and styles. | |

4. HETEROPOGON RITCHIEI Blatter & McCann.

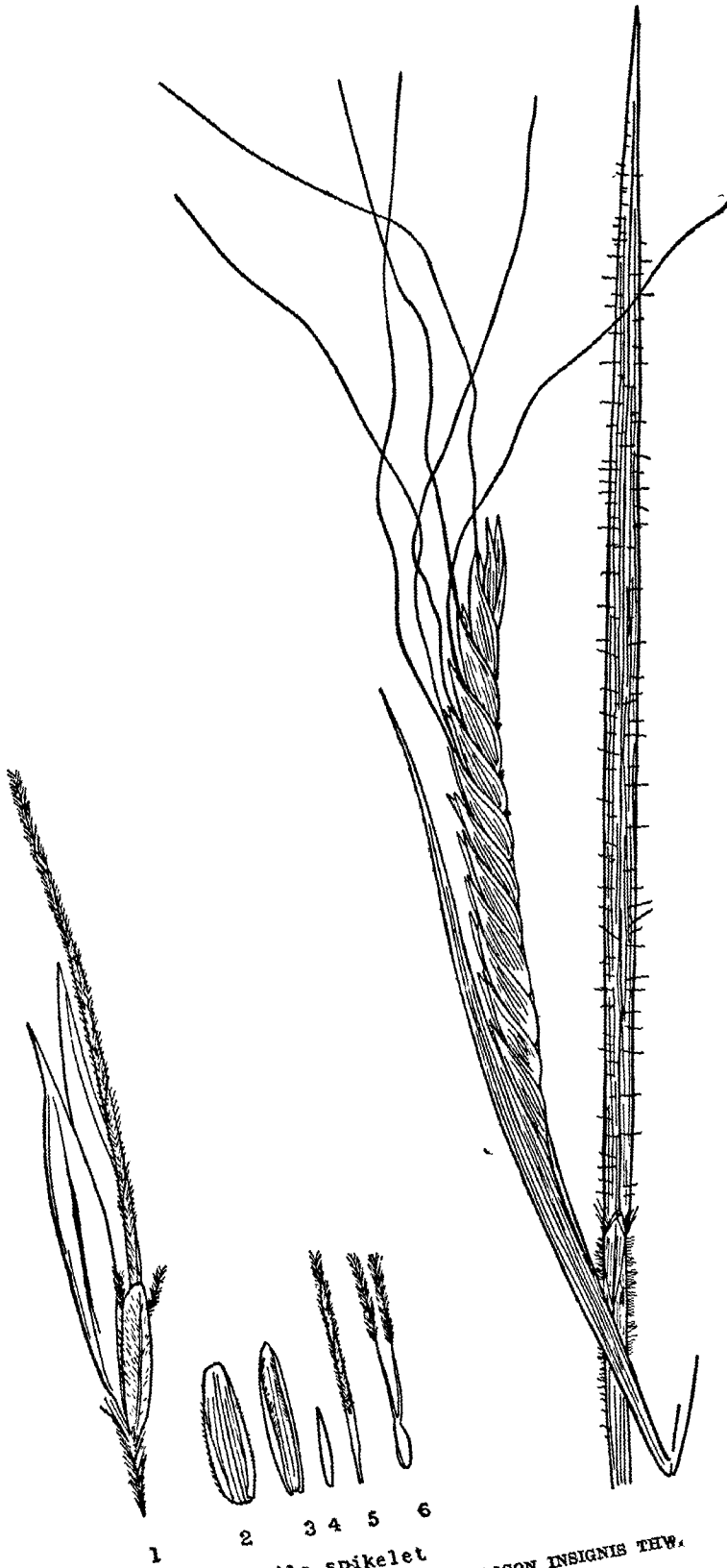
PLATE 70

Heteropogon Ritchiei Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 623.

Andropogon Ritchiei Hook. f Fl. Brt. Ind. VII (1896) 201; Cooke Fl. Bomb. II (1908) 990.

Etymology : Dr. Ritchie collected many plants in Belgaum and Kanara.

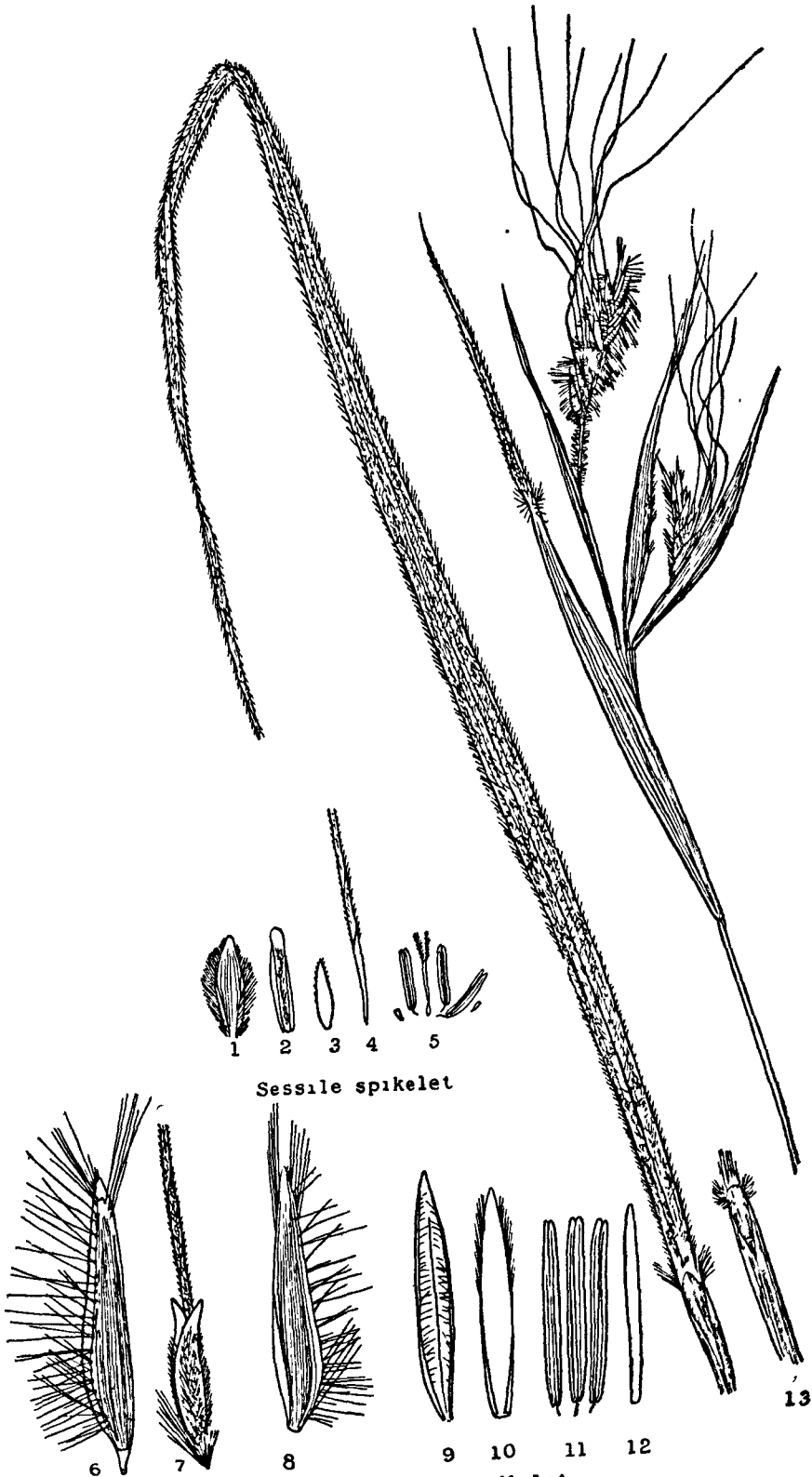
Description : Stems stout, erect, rigid, 1.2 m and more high. Leaves 45 by 1 cm., linear from a narrow base, bluntly acuminate, flat, rigid, shortly hairy on both sides with bulbous-based hairs, the margins spinulose serrulate, sheaths glabrous; ligule 6 mm. long, membranous, divided almost to the base into numerous narrow acute segments.



1
2 3 4 5 6
Sessile spikelet

HETEROPOGON INSIGNIS THW.

Dohn: B. K. F.



Sessile spikelet

Pedicelled spikelet

HETEROPOGON RITCHIEI BLATTER & McCANN.

Dein : B. K. Bhide.

Racemes 2.5-5 cm long, green, hispid, the lower 1-2 pairs of spikelets homogamous. Sessile spikelets rather more than 6 mm long, callus nearly 2.5 mm. long, densely bristly with brown hairs; lower involucre glume broadly ovate when opened out, bluntly acuminate, truncate, hairy on the back, the margins narrowly incurved, keels bristly, not channelled, dorsally obscurely nerved, upper involucre glume linear-oblong with rounded and shortly apiculate apex, 3-nerved, with a coriaceous hispid centre and membranous margins, lower floral glume 4 mm. long, narrowly linear, subacute, hyaline, nerveless; upper floral glume represented by the acute not dilated base of the awn, awn more than 3.8 cm. long, tortuous, with a dark brown more or less pubescent column, the upper part very slender. Pedicellate spikelets 13 mm. long; pedicels short, glabrous, lower involucre glume lanceolate, acute, the margins equally winged and infolded, the keels with a row of long tubercular-based golden-yellow bristles; upper involucre glume as long, lanceolate, 3-nerved, lower floral glume 10 mm. long, narrowly oblanceolate, hyaline, upper floral glume shorter, narrowly linear, acute.

Locality: *W Ghats* Panchgani, W. slope of Third Tableland (McCann 1788!).

Deccan Katraj Ghat, 11 miles S. E. of Poona (Gamme 1037!), hills near Poona (Woodrow)

S. M. Country Belgaum (Ritchie *teste* Hook f.).

Ecology: A tall grass growing in open grass-land. Stout stiff roots from the lowest nodes.

Distribution: W Peninsula, apparently endemic.

Explanation of Plate 70: *Heteropogon Ritchiei* Blatter & McCann.

- | | | |
|--|---|----------------------|
| 1. Lower invol. glume | } | Sessile spikelet. |
| 2. Upper invol. glume. | | |
| 3. Lower floral glume. | | |
| 4. Upper floral glume | | |
| 5. Stamens, ovary, styles and lodicules. | } | Pedicelled spikelet. |
| 6. Pedicelled spikelet. | | |
| 7. Sessile spikelet. | | |
| 8. Lower invol. glume | | |
| 9. Upper invol. glume. | } | Pedicelled spikelet. |
| 10. Lower floral glume. | | |
| 11. Stamens. | | |
| 12. Upper floral glume. | | |
| 13. Ligule. | | |

5. *HETEROPOGON CONTORTUS* Roem. & Schult.

PLATE 71.

Heteropogon contortus Roem. & Schult. Syst. Veg. II, 836; Duthie Grasses N. W. Ind. (1833) 19, Fodder Grasses N. Ind. (1888) 32, t. 19, Stapf in Fl. Trop. Afr. IX (1919) 411; Haimes Bot. Bih. and Or. (1924) 1040.

Andropogon contortus Linn. Sp. Pl. (1753) 1045; Lam. Encycl. t. 840, Kunth Enum. Pl. I. (1838) 486, Hack. Monogr. Androp. (1889) 585 (*excl. A. polystachyus* Roxb.); Roxb. Fl. Ind. I (1832) 253; Grah. Cat. Bomb. Pl. (1839) 238; Dalz. & Gals. Bomb. Fl. (1861) 300; Lisboa Bomb. Grasses (1896) 84; Hook. f. Fl. Brit. Ind. VII (1896) 199; Cooke Fl. Bomb. II (1908) 990.

Heteropogon hirtus Pers. II, 533, Balf. Fl. Socotra (1888) 316.

H. glaber Pers. l. c.; Beauv. Agrost. (1812) 134, t. 23, fig. 8.

H. hirsutus Beauv. l. c.

H. Allouvi Roem. & Schult. l. c.; Reichb. Ic. Fl. Germ. I, t. 53, fig. 1496-7.

H. polystachyus Nees Agrost. Bras. 364.

H. Roxburghii Walk.-Arn. ex Nees in Nov. Act. Nat. Cur. XIX, Suppl. I, 183.

H. Hohenackeri Hochst. ex Miq. Anal. Bot. Ind. II, 24.

H. hispidissimus Hochst. ex Steud. Syn. Pl. Glum. I (1855) 367.

H. besukiensis Miq. Fl. Ind. Bat. III, 494.

Andropogon secundus Willd. ex Nees Agrost. Bras. 364.

A. firmus J. S. Presl in C. B. Presl Rel. Haenk. I (1830) 334.

A. firmus Kunth Enum. Pl. I (1838) 486.

A. messanensis Bivona ex Guss. F. Sic. I (1827-8) 164.

A. besukiensis Steud. in Zoll. Syst. Verz. II (1854) 59.

A. Bellardi Bubani in Nuovo Giorn. Bot. V, 317.

Vernacular names: Spear grass, Nani sunkhah, Sunkhah, Survalu, Kusali, Kusal, Sukhli kursali, Garyali, Pandri-sukhah, Bal, Bale, Suckeri musaach, Suckal, Itali-suckal, Dakli-suckal.

Etymology : *Contortus* means twisted alluding to the awns in fruit.

Description : Perennial; stems 0.3-1.5 m. long, densely tufted, erect or decumbent below, slender, leafy chiefly at the base, simple or subfastigately branched, compressed towards the base. Leaves 15-30 cm. by 2.5-5 mm., linear, often shortly and abruptly (rarely long-) acuminate, flat, suberect, rigid, often sparingly ciliate towards the base, sometimes with scattered bulbous-based hairs above, scaberrulous below, sheaths compressed, keeled, glabrous, the mouth shortly auricled; ligule short, truncate, ciliate.

Racemes 3.8-7.5 cm long, internodes very short, the lower narticulate; spikelets closely imbricating, subsecund, the lower 2-6 or more sessile, awnless, male or neuter, the upper sessile spikelets narrow, long-awned, female. Sessile (female) spikelets 6 mm. long, callus long, acute, pungent, bearded with reddish brown hairs, lower involucreal glume linear-oblong, truncate, dark brown, many-nerved, hispidulous, margins strongly incurved (not winged), tip membranous, upper involucreal glume linear, obtuse, concave, rigidly coriaceous, dark brown, hispidulous, lower floral glume short, oblong, truncate, nerveless; upper floral glume represented by the subulate white base of a hirsute awn which reaches 7.5 cm or more long. Pedicellate spikelets much longer than the sessile (8-13 mm long), pedicel very short, lower involucreal glume lanceolate, usually obliquely twisted, herbaceous, dorsally hispid with long bulbous-based hairs, the margins more or less (often unequally) winged, the wings serrulate; upper involucreal glume oblong-lanceolate, acuminate, 5-nerved, margins hyaline, lower floral glume oblong, 1-nerved, upper floral glume obovate-oblong, ciliate, nerveless. Lower sessile spikelets like the pedicellate, more or less covered with bulbous-based hairs.

Locality : *Kathwar* Junagad (Blatter 3789 !).

Gujarat Sevaha (Chibber !), road to Lasandra (Chibber !); Sungiri (Gammie 15586 !)

Khandesh . Bhusawal (Gammie !), Toranmal (McCann 9640 !).

Konkan . Dake forests (Ryan 717 !), Osarvira forest, Mokhada Range (Ryan 190 !), Malabar Hill (McCann 3620 !), Mulgaum (McCann 4245 !); Parsik, railway line (McCann 9655 !), Kanari Caves, above (McCann 9662 !).

W Ghats . Igatpur (McCann 4328 !), Khandala, very common all over the hills (McCann 9422 !); Panchgani (Blatter & Hallberg B1246 ! B1296 ! B1308 !); Castle Rock (Gammie 15686 !)

Deccan . Katraj Ghat, 11 miles S E of Poona (Shevade !); Trimbak (Chibber !); Bairawadi, Purandhar (McCann 5059 !), Rahuri (Nana A264 !); Poona, Chhattarshunji Hill (Ezekiel !), Manmad, river-bed (Blatter A269 !)

S M. Country . Dharwar, 2,400 ft, rainfall 34 in. (Sedgwick 1820 !); Badami (Talbot 2925 !).

N. Kanara . Yellapur (Talbot 734 !).

Ecology : For an interesting account of this grass see W. Burns, L. B. Kulkarni and S. R. Godbole . A Study of Some Indian Grasses and Grasslands, p. 28-44.

Distribution : Mediterranean region and tropics, subtropics generally.

Economic uses : As to grass see Burns and others just cited. Considered a good fodder grass, especially when young and green. Used as a thatching material in some parts. On the other hand a very troublesome weed on account of the sharp callus of the spikelets.

Explanation of Plate 71 : *Heteropogon contortus* Roem. & Schult.

- | | |
|-------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelet. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume | |
| 4. Lower floral glume. | |
| 5. Upper floral glume | |

VARIETIES.

Hackel (l c) distinguishes 2 varieties and, excluding *polystachyus*, 5 subvarieties. His first variety *genunus* is characterized by the male spikelets being more or less covered on the back or at least above or towards the margins with white, patent, tubercle-based bristles. This character together with the degree of ramification of the culms forms the foundation of 4 subvarieties: *typicus*, *Rozburghii*, *hispidissimus* and *secundus*.

The second variety *glaber* has the male spikelets glabrous. Both varieties are represented in India, and all the subvarieties except *secundus*.

To Hooker f. (l c) these varieties and subvarieties appear "to be too inconstant for definition", and, according to Stapf (l c), the inconstancy of those characters "is so evident that it is not worth while to discriminate between the forms corresponding to them." Haines, too, has abstained from distinguishing varieties and forms.



HETEROPOGON CONTORTUS ROEM & SCHULT.

Dehn: B. K. Bhude.

Burns and others in the paper quoted above (p 40) wrote in 1925 "In our observations at Kalas and elsewhere we noticed variability within the species, and early came to the conclusion that there must be definite varieties of *Andropogon contortus*. We can say with confidence that there are at least two varieties, differing markedly in size, habit, longevity, and in morphological characters. One is small and annual, the other large and perennial." Since then Patwardhan and Hedge have published a paper¹ in which they describe in detail the morphology, anatomy, physiology and ecology of the 2 varieties

Key to the varieties —

- A. Lower involucreal glume of pedicelled spikelet sparsely hairy with long tubercle-based deciduous hairs on the back, in the upper part and towards the margins, lower part glabrous — Perennial . . . (a) var. *genuinus*, subv. *typicus*.
- B. Lower involucreal glume of pedicelled spikelet densely hairy with tubercle-based persistent hairs all over the back, hairs in lower part shorter than in upper. — Annual . . . (b) var. *genuinus*, subv. *hispidissimus*

a VAR. GENUINUS, SUBV. TYPICUS Blatter & McCann.

Heteropogon contortus, var. *genuinus*, subvar. *typicus* Blatter & McCann, comb. nov

Andropogon contortus, var. *genuinus*, subvar. *typicus* Hack Monogr. Androp. (1889) 586.

Heteropogon hirtus Pers Syn II, 533.

For detailed description see G. B. Patwardhan and G. R. Hedge in Journ. Ind. Bot. Soc. VI (1927) 213-216, and in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 625.

b. VAR. GENUINUS, SUBV. HISPIDISSIMUS Blatter & McCann.

Heteropogon contortus, var. *genuinus*, subvar. *hispidissimus* Blatter & McCann, comb. nov

Andropogon contortus, var. *genuinus*, subvar. *hispidissimus* Hack Monogr. Androp. (1889) 587

A. besukiensis Steud. in Zoll. Syst. Veg. II (1854) 59.

Heteropogon hispidissimus Hochst. in Steud. Syn. Pl. Glum. I (1855) 367.

For description see Patwardhan and Hedge l. c., and Journ. Bomb. Nat. Hist. Soc. 32 (1928) 625

The former paper contains valuable ecological notes (pp 216 and 217) on both varieties.

39 ISEILEMA Hack.

Small annual or perennial grasses; stems slender, compressed, many-noded. Leaves linear from a usually rounded equilateral base, sheaths compressed, keeled, shorter than the internodes

Panicle usually occupying $\frac{1}{2}$ the stem, branches usually fasciated and interspersed with scarious spathe-like bracts, proper spathes boat-shaped, acute, compressed, more or less herbaceous on the back, many-nerved, with scarious margins, racemes fasciculiform, solitary at the apex of the stem and branches, articulate with the peduncle below the lowest spikelets, at length all falling away from it. Spikelets dimorphous, the 4 lower whorled, male or neuter, forming an involucre round the unarticulate rhachis. Involucreal spikelets pedicellate, pedicels short, flattened. Glumes 3, lower involucreal glume oblong-lanceolate, 3-5-nerved, upper involucreal glume similar, 3-nerved, floral glume hyaline, 1-nerved. Lodicules cuneate, retuse. Anthers violet. Pedicellate spikelets on long slender pedicels, similar to the involucreal. Bisexual spikelets lanceolate or linear-lanceolate, lower involucreal glume truncate or shortly 2-fid at the tip, upper involucreal glume as long, mucous, hyaline, glabrous, lower floral glume small, sometimes wanting; upper floral glume an awn longer than the spikelet

Species 5.—Indo-Malaya, Australia.

The essential points in the diagnosis of this genus are clearly brought out by R. S. Hole: The Indian Species of *Iseilema*, in Agricultural Journal of India. Special Indian Science Congr. number, 1917.

¹ G. B. Patwardhan & G. R. Hedge, Two Varieties of *Andropogon contortus* Linn. In Journ. Ind. Bot. Soc. VI (1927) 213

Cooke has described 2 species; *I. Wrightii* Anders. and *I. laxum* Hack. We add a third one, *I. anthephoroides* Hack.

- A. Lower involucrel glume of hermaphrodite spikelet dorsally appressed hairy at base and ciliate on margins in basal $\frac{1}{4}$. 1. *I. anthephoroides*.
 B. Lower involucrel glume of hermaphrodite spikelet glabrous dorsally at base and on margins in basal $\frac{1}{4}$
 I Spathe and upper floral leaf not tubercled on keel . . . 2. *I. laxum*.
 II Spathe and upper floral leaf tubercled on keel . . . 3. *I. Wrightii*.

1. *ISEILEMA ANTHEPHOROIDES* Hack.

PLATE 72.

Iseilema anthephoroides Hack Monogr Androp (1889) 683, Hook. f. Fl. Brit. Ind VII (1896) 219; Haines Bot. Bih. and Or. (1924) 1054.

Description : A much tufted annual grass, very leafy below, with many stems 30-80 cm. high, sometimes pink, nodes glabrous. Leaves mostly short, the longer ones about 13 cm. by 5 mm., subobtusely, ciliate at base and tip of sheaths, cilia with small tubercle-bases, blades with scabrid margins, nerves usually fine and uniform; ligule of short fine hairs.

Panicles long, rather strict, but some of the spatheoles divergent, lower spathes foliaceous, upper with shorter blades, base of blade and top of sheath with very long cilia, spathes often with many tubercles on the margins. Spatheoles cymbiform, not acuminate, smooth and glabrous or minutely tubercled and scaberulous, margins scarious, several spatheoles from each spathe or leaf-sheath. Peduncle of cluster very short, 2-5 mm. long. Cluster scantily bearded at the base. Involucrel spikelets broadly oblong, 4 mm long, rounded at tip, not or very sparsely ciliate, their pedicels about 1 mm. long and nearly as broad at top, compressed, bearded. Glumes 2 only. Lower involucrel glume with narrowly inflexed margins, strongly 2-nerved on the back and almost sulcate on either side of midrib, 2 other partial nerves between the strong ones, upper involucrel glume nearly as long, flat, oblong, obtuse, 1-nerved; floral glume absent. Anthers yellow. Sessile spikelet 5-6 mm. long, the suddenly tapering part or beak rather longer than the lower broader part. Lower involucrel glume 2-cuspidate at tip, 4-nerved between keels, hispid-hairy on the back on the wider portion, the beak scabrid or scabrellous; upper involucrel glume as long, narrowly lanceolate with prominent ciliate keel on lower third, scabrellous above, margin inflexed. Lower floral glume very narrow, 2-nerved, ciliate, upper reduced to the membranous base of the awn, awn 12-14 mm. long, very slender, nearly smooth.

In general appearance this species is a stout plant of low growth with short leaves, while *I. Wrightii* is a tall slender plant with long leaves. *I. laxum* is more or less intermediate in this respect between those two species.

The hairs of the pedicel of the involucrel spikelets are as long or longer than the pedicels. The hairs of the pedicel of the pedicelled spikelets reach almost $\frac{3}{4}$ the length of the spikelet. The involucrel spikelets are frequently pink or purple. The upper pedicelled spikelet is often reduced.

Locality : Khandesh. Near Naradana (Blatter & Hallberg 5206 !)

W. Ghats : Panchgani (Blatter 1794 !).

Deccan . Katraj Ghat (Gammie 929 !); Deolali (Blatter & Hallberg A316 !); Chhattarshunji Hill, Poona (Ezekiel !); Pashan (Gammie !).

S. M. Country : Black soil fields E. of Hubli (Sedgwick & Bell 5295 !); Yelvingi (Sedgwick 2085 !).

Distribution : W. India and Deccan.

Economic uses : A smaller yielder and an inferior fodder plant than *I. laxum*. See W. Burns, Bull. 78, Dept. Agric. Bombay, p. 11.

Explanation of Plate 72 : *Iseilema anthephoroides* Hack.

- | | |
|--------------------------------------|------------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume. | |
| 3. Upper invol. glume. | |
| 4. Lower floral glume. | |
| 5. Grain and styles. | |
| 6. Upper floral glume. | |
| 7. Bract. | |
| 8. Involucrel and sessile spikelets | } Involucrel spikelet. |
| 9. Lower invol. glume. | |
| 10. Upper invol. glume. | |
| 11. Stamens and lodicules. | |



ISEILEMA ANTHEPHOROIDES HACK.

Drawn: B. K. Bhida.



ISEILEMA WIGHTII ANDERS.

Drawn: R K B

2. *ISEILEMA LAXUM* Hack

Iseilema laxum Hack Monogr Androp (1889) 682, Lisboa Bomb Grasses (1896) 88; Duthie Fodder Grasses N Ind (1888) 43; Hook f Fl Brit Ind VII (1896) 218; Cooke Fl Bomb. II (1908) 996

I. prostratum Anders in Nov Act Soc Sc Upsal ser 3, II (1858) 251 (*excl syn*) t 111

Vernacular names : Shata, Gandwel, Tambit, Tambrut, Gandhu, Gandil, Chamge, Dangers, Masel

Etymology : *Laxum*, lax, refers to the lax sheaths

Description : Perennial, stems 15-50 cm long, ascending from a stout hard sometimes shortly creeping rootstock, very slender, simple or sparingly branched, root-fibres wiry. Leaves all cauline or the lower radical with equitant sheaths, 7.5-15 cm by 1.2-3 mm., linear, obtuse or subobtusate, glabrous, but often ciliate near the base, scaberulous above, smooth below, the margins scabrid, sheaths lax, quite glabrous, ligule short, truncate, membranous, ciliate

Panicle occupying $\frac{1}{2}$ the stem, racemiform, long, narrow, of distant axillary pedunculate fascicles 6-13 mm long, outer spathes 0.6-2.5 cm long, narrowly lanceolate, glabrous or with a few hairs near the margin; proper spathes 8-13 mm long, elliptic-lanceolate. Involucral spikelets truly whorled, 4 mm long, pedicellate, oblong-lanceolate, acute, pedicels short, flattened, bearded at base, lower involucral glume acute, sparsely ciliate, 3-5-nerved, upper involucral glume oblong-lanceolate, acuminate, sparsely ciliate, 3-nerved, lower floral glume linear, glabrous, hyaline. Lodicules cuneate, retuse. Anthers long, narrow. Pedicellate spikelets on long ciliate pedicels, lanceolate, glabrous. Bisexual spikelets narrowly lanceolate, 5 mm long, narrowed into a slender stipe, glabrous, lower involucral glume chartaceous, 2-fid or truncate at the tip, margins scaberulous in the upper third, thin, faintly 3-5-nerved; upper involucral glume lanceolate, acuminate, 1-nerved, tip scaberulous, upper floral glume a very slender geniculate awn, 8-13 mm long, the column equalling the subulate part.

Locality : *Khandesh* Red upland near Talod (Sedgwick !), Bor, Bor River (Blatter & Hallberg 4429 !), Toner, Tapti bank (Blatter & Hallberg 5167 !), Dadgaum (McCann A322 !).

Konkan · Sion (McCann 3668 !), Thana (McCann 8728 !), Parsik Hill (McCann A321 !), Bhandup, ricefield (McCann A323 !), Trombay (McCann A324 !).

W Ghats Grass-lands between Mahabaleshwar and Panchgani (Sedgwick & Bell 4742 !).

Deccan : Nasik (Bourke !), Lohagad, half way up (McCann A320 !); Poona (Jaquemont 439).

S. M. Country Dastikop (Sedgwick 2059 !), Dharwar (Sedgwick 1826 !); Belgaum (Ritchie 799).

N. Kanara : Halyal (Talbot 2087 !), Sirsi (Kulkarni !)

Ecology · The spikelets in this and the other species are carried away by the wind in a body.

Distribution : Upper Gangetic Plain, Orissa, Deccan, W. Peninsula.

Economic uses : Considered to be the best fodder grass in Central and S. India.

3. *ISEILEMA WIGHTII* Anders.

PLATE 73.

Iseilema Wightii Anders in Nov Act. Soc. Sc. Upsal. ser. 3, II (1858) 251; Hack. Monogr. Androp (1889) 679; Lisboa Bomb Grasses (1896) 87, Hook. f. Fl. Brit. Ind. VII (1896) 218, Cooke Fl Bomb II (1908) 996.

Anthusira prostrata Willd Sp Pl. IV, 901, Roxb. Fl. Ind. I (1832) 250.

A. cuneata Edgew. in Journ. As Soc Beng. (1852) 182, Duthie Grasses N. W. Ind. (1883) 24

A. Wightii Nees ex Steud. Syn. Pl. Glum. (1855) 400.

Andropogon prostratus Lmn Mant (1767) 304.

Cymbopogon glandulosus Spreng. Pug II, 14.

Vernacular names : Achi grass, Sona, Tambrut, Tambit, Gondwal, Gannu, Mussan, Mabil, Moshu, Gandhi, Gandel.

Description : Perennial; stems often prostrate and rooting at base, then ascending 20-90 cm long, rarely as thick at the base as a goose-quill, nodes more or less bearded. Leaves 10-20 cm. by 2-3 mm, linear, acute, glaucescent or sometimes as well as the whole plant reddish, smooth or scaberulous, the floral leaves scabrid with tuberculate margins, sheaths lax, sometimes with bulbous-based hairs; ligule short truncate, membranous, ciliate.

Panicle occupying $\frac{1}{2}$ the stem or more, linear-oblong, more or less compound, erect, spreading; rachis bearded at the nodes; lower branches 2, the upper as many as 5, proper spathes 8-13 mm. long, linear-lanceolate, with scarious margins. Involucral spikelets male

or neuter, 3 mm. long, shortly pedicellate, lanceolate-oblong, green or tinged with violet; lower involucre glume subacute, with 5 elevated ribs on the back, sulcate between the ribs; upper involucre glume glabrous with broadly infolded margins, 1-nerved; lower floral glume much shorter, oblong, 2-3-toothed, nerveless, glabrous. Anthers 1.6 mm. long. Pedicellate spikelets on very slender pedicels. Bisexual spikelets 1.6-3 mm. long; lower involucre glume acute (not acuminate nor beaked), obscurely 4-nerved; upper involucre glume equalling the lower, elliptic-lanceolate, acute or subobtusate, often mucronate, obtusely keeled on the back, 3-nerved, glabrous; upper floral glume an awn, 6-13 mm. long, the column exceeding the subulate part.

Locality : *Kathnawar* : Morvi (Woodrow)

Gujarat : Kharaghoda (Saxton 503C !); in very marshy valley between Wastrapur and Thaltij (Sedgwick 322 !).

Khandesh : Antroli, Bori River (Blatter & Hallberg 5150 !).

W. Ghats : Panchgani (Blatter & Hallberg B1294 !).

Deccan : Poona (Woodrow).

S. M. Country : Kunnur (Sedgwick & Bell 4922 !); Ramibennur (Blide !); *Haveri* (Talbot 2254 !), *Dharwar* (Nana A325 !), *Belgaum* (Woodrow).

N. Kanara : Halyal (Talbot 2143 !).

Ecology : Common in the Carnatic in places where water stagnates. "In Bundelkhand and Central Provinces it is frequently the prevailing grass on the black soil, its reddish coloured stem rendering it a conspicuous object from a considerable distance" (Duthie).

Distribution : Throughout India.

Economic uses : A fair fodder.

Explanation of Plate 73 : *Issolema Wrightii* Anders.

1. Spikelets and bract.
2. Node.
3. Ligule.

40. THEMEDA Forsk.

Tall annual or perennial grasses. Leaves long, narrow.

Spikelets heteromorphous, clustered on the articulate fragile rachis of short solitary racemes subtended by proper spathes and crowded in paniculate fascicles, lowest 2 pairs of each raceme closely approximate, male or barren, awnless, sessile or subsessile, usually persistent, forming a spinous tetramerous whorl enveloping the upper 1-3 pairs, each of which consists of a sessile hermaphrodite, and a pedicellate male spikelet, the latter much resembling those of the involucre. Florets 2, the lower reduced to an empty glume, the upper hermaphrodite in the sessile upper spikelets, male in the involucre and pedicellate spikelets or these more or less reduced or barren. Bisexual spikelets : involucre glumes equal or subequal; lower usually coriaceous, at length hardened and often dark brown to almost black; upper obtusely keeled, coriaceous and channelled along the keel, with membranous margins; lower floral glume hyaline; upper very narrow, passing from a hyaline base into a usually stout awn, very rarely linear and awnless. Palea obsolete or 0. Lodicules 2, cuneate, glabrous. Stamens 3. Stigmas laterally or subterminally exserted. Grain linear-obovoid, biconvex, with 2 grooves on the anterior side. Involucral and pedicellate spikelets : involucre glumes equal or subequal, lower herbaceous, dorsally flattened, 2-keeled, many-nerved; upper membranous, lanceolate, acute, 3-nerved, with ciliate margins; lower floral glume hyaline, 1-nerved or like the upper suppressed.

Species about 16—Tropical and subtropical regions of the Old World, chiefly Indo-Malayan.

Grasses of open grass-land during the monsoon. They flower and die down with the approach of the dry season. Frequently the species are mixed in the same patch, but generally exclude everything else. Isolated specimens may be found at any time of the year in suitable localities.

Cooke describes 4 species : *T. imberbis* T. Cooke, *T. ciliata* Hack., *T. cymbaria* Hack., and *T. tremula* Hack. Following the laws of priority we have to substitute for the first two : *T. triandra* Forsk. and *T. quadrivalens* O. Kuntze.

I. Involucral spikelets truly verticillate.

1. Involucral spikelets glabrous or more or less irregularly beset with tubercle-based hairs 1. *T. triandra*.
2. Involucral spikelets always with a row of stiff bristles along the flexures near the tips, the bristles arising from coarse pale tubercles 2. *T. quadrivalens*.



Sessile spikelet
THEMEDA TRIANDRA FORSK.

II. Involucral spikelets in closely superposed pairs.

1. Inflorescence a decompound thyrsiform panicle. Lower involucral glume of bisexual spikelets not channelled 3. *T. cymbaria*.
2. Inflorescence a racemiform panicle. Lower involucral glume of bisexual spikelets deeply channelled 4. *T. tremula*.

1. THEMEDA TRIANDRA Forsk.

PLATE 74.

Themeda triandra Forsk. Fl. Aegypt-Arab. (1775) CXXIII et 178; Schweinf. in Bull. Herb. Boiss II, Append. II, 16, 95; Stapf in Fl. Trop. Afr. IX (1919) 416, *partem tantum nostrae species amplectens*.

T. Forskalis Hack. Monogr. Androp. (1889) 659 (*excl. syn. Anthistira hispida* Thunb. *quae est Tristachya leucothra* Trin. *sec. Stapf*), Duthie Fodder Grasses N. Ind. (1888) 43; Stapf in Kew Bull. (1907) 212.

Anthistira umberbis Retz. Obs. III (1783) 11; Desf. in Journ. de Phys. XL, 293, t. 1; Kunth Enum. I (1838) 481, Steud. Syn. Pl. Glum. I (1855) 401, Stapf in Dyer Fl. Cap. VII, 366, Hook. f. Fl. Brit. Ind. VII (1896) 211; Trin. Fl. Ceyl. V, 248, Prain Beng. Pl. 1207.

A. glauca Desf. Fl. Atlant. II, 380, t. 254 (*excl. syn. Stipa paleacea* Vahl), Coss. & Durieu Expl. Scient. Alger. II, 52.

A. Desfontainae Kunth Rev. Gram. I (1829) 161.

A. ciliata Retz. l. c. (*non Linn. f.*), Lamk. Ill. t. 841, fig. 2; Cav. Ic. 5, t. 459, Nees in Linnaea VII, 284 et in Fl. Afr. Austr. (1841) 121, Oliv. in Trans. Linn. Soc. XXIX, 176; Roxb. Fl. Ind. I (1832) 247; Grah. Cat. Bomb. Pl. (1839) 239; Dalz. & Gals. Bomb. Fl. (1861) 304; Thw. Enum. Pl. Zeyl. (1864) 366, Benth. Fl. Austr. VII (1878) 542.

A. Forskalis Kunth Rev. Gram. I (1829) 162, Enum. Pl. (1838) 481.

A. vulgaris Hack. in Engl. & Prantl. Naturl. Pflanzenfam. II, pars 2 (1887) 29.

A. punctata Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 448.

A. paleacea Ball. in Journ. Linn. Soc. Bot. XVI, 734.

A. australis R. Br. Prodr. (1810) 200.

A. cuspidata Anders. in Nov. Act. Upsal. 2 (1856) 229.

A. caespitosa Anders. l. c. 241.

A. argentea Nees Fl. Afr. Austr. (1841) 124.

A. depauperata Anders. l. c. 243.

A. syriaca Boiss. Diagn. Pl. Or. ser. I, fasc. 13, 72.

Themeda polygama Gmel. Syst. 149.

Stipa arguens Thunb. Prodr. 20 (*non Linn.*)

Calamina umberbis Roem. & Schult. Syst. II (1817) 810.

Themeda umberbis T. Cooke in Cooke Fl. Bomb. II (1908) 993.

T. umberbis Haines in Bot. Bih. and Or. (1924) 1049.

Vernacular names : Batani, Bunden, Bungrat, Marar, Musani, Bhoru, Karad.

Etymology : *Themeda* was formed from the Arabic name of the plant *Thamed*.

Hooker f. who deals with this species under *Anthistira* Linn. says in a preliminary remark (F. B. I. VII, 211). "The species of this Genus are most difficult of discrimination, of which the best proof is the irreconcilable conclusions of two excellent botanists, both experts in the order of *Gramineae*, Anderson (in Nov. Act. Upsal. III, II (1856) and Hackel (Monogr. Androp.)"

He then criticises Hackel for having restored Forskahl's name of *Themeda* 'because of its having four years of priority, and of Linnaeus' description of *Anthistira* being very inaccurate'. He admits the claim of priority, but as to the other reason he rightly adds that, if inaccurate description has to be considered, a host of the genera of old authors would have to be invalidated. Hooker finally decides in favour of *Anthistira* because this genus 'had for upwards of a century been adopted by all botanical writers.' This reason, however, does not hold good in view of the present rules of nomenclature. Hackel restored *Themeda* in 1889 and since then most systematists have followed his example. It was easy to settle this point, but the real difficulty comes in when we have to define and give a name to all the material gathered by Hackel (l. c. 659-664) under his *Themeda Forskalis*, and by Hooker f. under *Anthistira umberbis* Retz. (F. B. I. VII, 211).

A glance at Hackel's synonymy and localities shows that he has included all the forms of this highly variable grass which are found in the tropical, subtropical and sometimes in the temperate regions of the Old World. The same applies to Hooker's *A. umberbis*, except

that he separated Hackel's var. *dubia laxa* and restored it to its former specific rank of *A. laxa* Anders. But this is of minor importance in this connection. It does not change the fact that both Hackel and Hooker describe the same material and of the same area though under different names.

Hackel justifies the adoption of the specific name *Themeda Forskalii* in this way. "*Themeda triandra* Forsk. Fl. aeg.-arab. p. 178, *Anthist Forskalii* Kunth Revis. Gram. 1, p. 162, *generis typus*, a *Forskalia prope Bulgose in Arabia felici lecta, probabiliter etiam varietas est Th. Forskalii meae, sed descriptio rem dubiam relinquit, specimina authentica desiderantur. Nec hucusque ullam hujus generis speciem in Arabia felici lectam vidi, etsi probabile est, Th. Forskalii varietates in Syria Abyssiniaque crescentes etiam in Arabia inveniri. Itaque nomen specificum "triandra" iamquam dubium et rem indicans quae in hoc et plerisque Graminearum generibus nullus est momenti, sepositum, "Forskalii" a Kunthio datum non minus quidem dubium, sed generis auctorem commemorans receptum*"

Hooker does not agree with Hackel, "The earliest names of this plant are *Themeda triandra*, Forsk., and *Anthistura umberbus* Retz. Hackel has abandoned both, substituting first *Anthistura vulgaris*, and then *Themeda Forskalii*, on the ground that *A. umberbus* was perhaps not Forskahl's *T. triandra* (why then call it *Forskahlia*?) of which no type specimen exists, and because *triandra* indicates a character of no individual value in grasses. In so doing he overlooked Gmelin's name of *T. polygama* (Syst. 149). Having regard to the wide range of *A. umberbus*, from Australia to Africa, its presence in Arabia might well be anticipated, and that it is a native of that country is now proved by Schweinfurth's finding Hackel's var. *glauca* in that country. This makes the var. (which is local, and not Indian) the type of the species, and if Forskahl's name of *Themeda* is to be retained, necessitates a rearrangement of the varieties. To me it appears most expedient to retain Retz's name which applies to the prevalent form over the area of distribution as the specific one."

Hooker's reasons against Hackel's view are certainly valid, but his own *Anthistura umberbus* does not rest on a firmer foundation. The fact that the var. is local and not Indian should not prevent us from making it the type of the species, and the other circumstance that a rearrangement of the varieties will become necessary if the name *Themeda* is retained, can only be a reason of expediency.

So far we come to the conclusion that Hackel and Hooker deal with the same material, but that neither name is satisfactory.

We come now to the latest publication affecting our question. Stapf l. c. has adopted the name *Themeda triandra* Forsk. (1775) instead of *T. Forskalii* (1889), "as there is no doubt that the type of Forskahl's species, which apparently has been lost, was one of the forms covered by the description given by Stapf" (see Schweinfurth in Bull. Herb. Boiss. II, App. II, 16).

But here Stapf creates a new difficulty. His description applies only to the 'African share of Hackel's *T. Forskalii*'. In order not to be open to misstatements we quote the whole passage in which Stapf explains his position. "The species, as defined here, is, however, taken in a sense somewhat narrower than Hackel's, this restriction requires a short explanation. Hackel in his monograph of the *Andropogoneae* distinguishes 11 varieties and as many sub-varieties or forms within his *T. Forskalii*, whilst other authors have at various times described more than a dozen species, all of which come within the compass. There can be no doubt as to the close affinity of these forms and the question of their status is mainly one of expediency. A careful examination of the large amount of material at Kew and the British Museum has led to the conclusion that for the present it will be most useful to detach, firstly, those forms that are fairly uniform, and at the same time exclusive, over a large area, and secondly, those that, though of a limited range, stand out from the remainder by some character or characters. This leaves a residuum much less homogeneous than any of the segregates just referred to. It consists apparently of more or less fixed races, mutants, hybrids and edaphic forms which from herbarium material are the less separable because they are to a high degree independent of geographical areas. At the same time, however, they are all African with an extension into Arabia, Syria and the south-eastern corner of Asia Minor, and, taken as a whole, represent practically the African share of Hackel's *T. Forskalii*. It is to this aggregate that the description and synonymy given above apply."

From the above it is evident that Stapf's *T. triandra* Forsk. is not identical with Hackel's *T. Forskalii* and Hooker's *A. umberbus* Retz., as it comprises only the African element including "an extension into Arabia, Syria, and the south-eastern corner of Asia Minor". Stapf's synonymy leads to the same conclusion, except for the inclusion of *T. umberbus* T. Cooke (Fl. Bomb. II, 993). The Australian element *Anthistura australis* R. Br. has been separated by the same author as *Themeda australis* Stapf. It seems to us that Stapf's treatment of *T. triandra* is somewhat arbitrary. We quite agree that the name should remain and that it is the only correct name, but we cannot agree to its being restricted to the African element only, and it is difficult to understand why the Indian specimen should not go by the same

name If we could distinguish groups of varieties or forms that are confined to more or less definable geographical areas, it would be admissible to speak, e.g., of an African group and call it *T. trandra*, because Arabia exhibits one of those African forms, or of an Indian or Australian group, and name them accordingly. But experience shows that with regard to the material under review there are no such geographical areas which contain a group of varieties or forms that are peculiar to one area exclusively. A glance at the localities given by Hackel under the different varieties and subvarieties will confirm our statement.

We are, therefore, of opinion that the name *Themeda trandra* Forsk. should embrace all the material that was described by Hackel under *T. Forskalm*, by Hooker under *A. imberbis*, and by Cooke under *T. imberbis*.

Haines describes the material from Bihar and Orissa under the name of *T. imberbis* T. Cooke, and adds in brackets 'partly'. His species, therefore, is not Cooke's *T. imberbis*, but must be given some other specific name as long as Cooke's name stands. But if botanists adopt our *T. trandra* Forsk. Haines' name will be merged in it, and his material may be treated as a form or group of forms under that species.

Description: Perennial, densely tufted, stem 30-90 cm. high, stout or slender, erect, or geniculate and ascending, subsimple or branched, glabrous, polished, nodes glabrous. Leaves 7.5-20 cm. by 2.5-5 mm., narrowly linear, finely acuminate, coriaceous, flat, rather rigid, margins scabrid, sheaths compressed, keeled, smooth, ligule a narrow ciliate membrane.

Panicle narrow, racemiform, 7.5-20 cm. long, sparingly branched, branches solitary or the upper 2-3-nate, filiform, bearing capituliform usually dense distant fascicles of racemes; spathes lanceolate, obtusely acuminate, about 2.5 cm. long, usually bearded at the base, glabrous or sparsely hairy, greenish or tinged with red, racemes 1.3-2 cm. long. Involucral spikelets whorled, sessile, persistent, lanceolate, acute or acuminate, 6-16 mm. long, glabrous, or with short bulbous-based hairs, male, glumes 3. Pedicellate spikelets linear-lanceolate, glabrous, on short glabrous or subglabrous pedicels. Bisexual spikelet solitary, 6 mm. long, callus reaching 3 mm. long, pungent, bearded with coloured hairs. Lower involucral glume obtuse or notched, smooth except the tip, dark brown, not dorsally channelled, obscurely 7-9-nerved; upper involucral glume glabrous, lower floral glume glabrous, rather shorter than the involucral glumes, upper floral glume awned, awn 3.8-6.3 cm. long with a stout hispid column. Anthers 2 mm. long. Grain 2.5 mm. long, oblong, grooved ventrally.

This species is distinguished from *T. quadrivalens* by its greater size and by the clusters of spikelets (partial panicles) being more distant, more globose and more pendent. The callus is densely bearded with long brown hairs. The lower involucral glume is shining and glabrous, but about the upper $\frac{1}{2}$ is minutely hispid. At first the glume is pale, but eventually turns a rich brown. The callus is articulate on the pedicel and easily comes away with the spikelet. The spikelet, too, is articulate with the callus, but it requires a little force to disarticulate it.

Locality: *Gujarat* Ahmedabad (Gammie 16391 !).

Khandesh Toranmal (McCann 9813 !).

Konkan Mokhada Range (Ryan 2626 !), Mahaluxmi (Sabnis A297 !); Bhandup (McCann 9810 !); Bassein (McCann 4475 !).

W. Ghats Igatpuri (McCann 4322 !); Khandala, common (McCann A291 !); Panchgam (Blatter 3806 !, Blatter & Hallberg B1326 !); Castle Rock (Gammie 15728 !); Dudsagar Falls (McCann A298 !).

Deccan Ganeshkhund Botanic Gardens (Garade !), Bairawadi, Purandhar (McCann 5069 !), Poondra (Talbot 4307 !).

S. M. Country Devarayi, 1,800 ft., rainfall 90 in. (Sedgwick & Bell 4427 !); Dharwar (Nana A289 !).

Ecology: This species is the commonest of this genus throughout the Presidency. It sometimes covers large patches of land to the exclusion of almost every smaller plant. Generally it is subgregarious or gregarious.

Distribution: Africa, Indo-Malaya, Australia.

Economic uses: A very good fodder and hay.

Explanation of Plate 74: *Themeda trandra* Forsk.,

- | | |
|--------------------------|---------------------|
| 1. Involucral spikelet. | |
| 2. Pedicellate spikelet. | |
| 3. Spikelets in bract. | |
| 4. Lower invol. glume | } Sessile spikelet. |
| 5. Upper invol. glume. | |
| 6. Lower floral glume. | |
| 7. Upper floral glume. | |
| 8. Spikelet | |

2. *THEMEDA QUADRIVALVIS* O. Kuntze.

Themeda quadrivalvis O. Kuntze Rev. Gen. Pl. II (1891) 794; Stapf in Fl. Trop. Afr. IX (1919) 420, Haines Bot. Bih. and Or. (1924) 1050.

Andropogon quadrivalva (err. typog.), Linn. Syst. ed. 13, 758.

Themeda ciliata Hack. in Monogr. Androp. (1889) 664; Cooke Fl. Bomb. II (1908) 994.

Anthistura ciliata Linn. f. Suppl. (1781) 113; Gaertn. Fruct. II, 465, t. 175, Lam. Ill. t. 841, fig. 1; Beauv. Agrost. (1812) t. 23, fig. 7; Kunth Enum. I (1838) 481; Steud. Syn. Pl. Glum. I (1855) 401; Baker Fl. Maurt. (1877) 448, Balf. f. Bot. Socotra (1888) 317 (*partim*), Duthie Grasses N. W. Ind. (1883) 42; Hook. f. Fl. Brit. Ind. VII (1896) 213; Stapf in Dyer Fl. Cap. VII, 368.

A. scandens Roxb. Fl. Ind. I (1832) 248; Duthie Fodder Grasses N. W. Ind. (1886) t. 61.

A. semiberbis Nees Fl. Afr. Austr. (1841) 125.

Andropogon nutans Linn. Mant. II (1767) 303.

Vernacular names : Bongrut, Bhatu, Bhatu, Zini bathi, Mothu bathi, Bhatharu

Etymology : *Quadrivalvis* means having 4 glumes, referring to the bisexual spikelet.

Description : Annual; stems suberect or geniculately ascending and rooting from the lower nodes, very slender, terete, 30-90 cm. high, glabrous, simple or branched. Leaves 15-30 cm. by 4-6 mm., linear, acute, flat, flaccid, glabrous or hairy; sheaths glabrous or the upper with scattered bulbous-based hairs towards the mouth; ligules membranous, rounded, 2 mm. long, glabrous.

Panicle suberect, occupying $\frac{1}{2}$ - $\frac{3}{4}$ of the stem, usually dense, lower branches solitary or 2-3-nate, filiform, glabrous, undivided often to the middle, then bearing at equal distances usually shortly pedunculate dense clusters of racemes; spathes linear to subulate from a broad lanceolate base, 1.7-2.5 cm. long, glabrous or with scattered bulbous-based bristles; racemes 8-13 mm. long, erect. Involucral spikelets whorled, sessile persistent, linear-lanceolate, acute or acuminate, 4-6 mm. long, reddish, barren or imperfectly male; lower involucral glume beset along the winged keels with stiff bristles from large tubercular bases, otherwise glabrous. Pedicellate spikelets narrow, not winged, glabrous. Bisexual spikelet solitary, not exerted from the involucre, 4-5 mm. long, narrow, linear-lanceolate; callus very short, subobtusely bearded with short reddish hairs; lower involucral glume obtuse, brown, shining, obscurely 6-7-nerved; upper involucral glume glabrous; lower floral glume shorter than the involucral glumes, sometimes 2-toothed; upper floral glume awned; awn 2.5-3.8 cm. long, slender. Anthers 1 mm. long.

The lower involucral glume of the bisexual spikelet is shining, but beset all over with rather stiff hairs, those in the upper $\frac{1}{2}$ being stronger than those covering the other parts of the glume (the remarks regarding the articulation of the glume, callus and pedicel given under *T. trundra* apply also here). Callus densely bearded with long brown hairs. Lower involucral glume brown when mature.

Locality : Gujarat - Ahmedabad (Gammie 16391!).

Khandesh : Toranmal (McCann 9817!).

Konkan Parsik, railway line (McCann 9808!); Ahbaga, water works (Ezekiel!), S. Konkan (Stocks teste Cooke, Law), Salsette (Jaquemont 717 teste Cooke).

W. Ghats - Road, Mahabaleshwar to Pratapgad (Bhide 1170!); Panchgani (Blatter & Hallberg B1311! B1325!), Castle Rock (Gammie 15729!).

Deccan Pashan, near Poona (Gammie!); Purandhar (McCann 5571), Baira-wadi (McCann 507A!).

S. M. Country - Konankeri, 2,000 ft., rainfall 40 in. (Sedgwick & Bell 4943!); Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4486!); Dastakop, 2,500 ft., rainfall 35 in. (Sedgwick & Bell 2060!); Belgaum (Ritchie 886 teste Cooke).

N. Kanara Halyal (Talbot 2115!).

Ecology : A very common species during the monsoon, but it also flourishes during the dry weather. Common in the Carnatic, especially in the Mallad tract.

Distribution : N. W. India, Bengal, Central Provinces, W. Peninsula, Tenasserim. Introduced in tropical and S. Africa.

3. *THEMEDA CYMBARIA* Hack.

Themeda cymbaria Hack. in Monogr. Androp. (1889) 668, Cooke Fl. Bomb. II (1908) 994.

Anthistura cymbaria Roxb. Hort. Beng. (1814) 6, et Fl. Ind. I (1832) 251 (*excl. syn.*); Kunth Enum. Pl. I (1838) 482 (*excl. syn.*); Grah. Cat. Bomb. Pl. (1839) 219; Dalz. & Gibs. Bomb. Fl. (1861) 304; Hook. f. Fl. Brit. Ind. VII (1896) 215.

Vernacular names : Karar, Ful-gavat.

Etymology : *Cymbaria* is derived from *cymba*, a boat, therefore boat-shaped, alluding to the proper spathes.

Description : Perennial ; stems 0.9-2.4 m. high, as thick as a swan's quill below, erect, branched, smooth, clothed at the base with broad strongly compressed equitant leaf-sheaths together 3.8-5 cm. across ; internodes long, nodes glabrous or puberulous. Leaves 5-10 cm. by 4-8 mm., linear, finely pointed, glaucous beneath, green above, glabrous or ciliate at the base, scaberulous above, smooth beneath, margins scabrid, sheaths subcompressed, keeled, smooth, usually bearded at the mouth, the lower 13 mm. broad at the base, ligule reddish, membranous, glabrous.

Panicle 30-60 cm. long, occupying nearly half the stem, supra-decompound ; branches loaded with small shortly pedunculate oblong fascicles 13-20 mm. long, of nearly glabrous racemes ; proper spathes 13-17 mm. long, linear-lanceolate, boat-shaped, acuminate, finely pointed, glabrous or with hairy margins. Involucral spikelets 4-6 mm. long, contiguous in superposed pairs, glabrous. Pedicellate spikelets with glabrous pedicels. Bisexual spikelets solitary (rarely 2), subsessile, callus short, bearded with white hairs ; lower involucral glume 6 mm. long, dorsally convex, not channelled, smooth, polished, dark brown ; awn 13 mm. long, slender, smooth.

Locality : *Khandesh* · Dadgaum (McCann 9815 !), Toranmal (McCann 9818 !).

Konkan · Common (Cooke), I am doubtful (McCann).

W. Ghats : Lonavla (Garade !), Castle Rock (Gammie 15634 !).

N. Kanara · Mirjan (Hallberg & McCann A295 !).

Ecology : Generally found amongst bushes on hills, very common.

Distribution : W. Peninsula, Ceylon.

Economic uses : A coarse grass eaten by cattle. Also fit for hay.

4. THEMEDA TREMULA Hack.

PLATE 75

Themeda tremula Hack. Monogr. Androp. (1889) 667 ; Lisboa Bomb. Grasses (1896) 89 ; Cooke Fl. Bomb. II (1908) 995.

Anthistura tremula Nees ex Steud. Syn. Pl. Glum. (1855) 401 ; Hook f. Fl. Brit. Ind. VII (1896) 214.

Androscepra tremula Anders in Nov. Act. Upsal. ser. III, II (1856) 247.

Vernacular names : Bhatandi, Bungrat, Barki, Gundi.

Etymology : *Tremula* means trembling.

Description : Annual ? ; stems erect or ascending from a creeping rootstock, 0.3-1.2 m. high, stout or slender, leafy, subterete, simple or branched, smooth, polished, brown. Leaves 10-50 cm. by 4-8 mm., finely acuminate with setaceous tips, rigid, suberect, green, glabrous or nearly so, margins scabrid, sheaths slightly compressed, smooth ; ligule reduced to a very narrow membrane.

Panicle 30-60 cm. long, occupying $\frac{1}{3}$ - $\frac{1}{2}$ the stem, racemiform ; fascicles of racemes rather distant, on capillary flexuous peduncles 1.3-7.5 cm. long, subflabelliform or subglobose, 1.3-3.8 cm. broad, sometimes reduced to a few spathes and spikelets ; outer spathes longer than the fascicles, 2.5-3.8 cm. long, more or less hairy with simple or bulbous-based hairs, proper spathes 13-20 mm. long, lanceolate, acute, compressed, glabrous or with some bulbous-based hairs, margins scarious. Involucral spikelets in contiguous superposed pairs reaching 8 mm. long, green tinged with red, lower involucral glume linear-lanceolate, acuminate, covered with long often bulbous-based bristles, many-nerved ; upper involucral glume oblong-lanceolate, acuminate, 1-nerved, ciliate above the middle, margins inflexed ; lower floral glume as long, very narrowly linear, hyaline, 1-nerved. Lodicules cuneate. Anthers 2.5 mm. long. Pedicellate spikelets like the involucral, but nearly glabrous. Glumes 3, lower involucral glume winged on one margin, nerveless, the other two as in the involucral spikelets. Bisexual spikelets 2, sessile, 4 mm. long, linear-oblong, obtuse, callus small, with a short reddish beard, lower involucral glume scabrid, deeply channelled dorsally, nerveless, tip hirsute, narrowly truncate ; awn 1.3-2.5 cm. long.

Locality : *Konkan* · Trombay (McCann A293 !), Ghatkopar, Horse-shoe Valley (McCann A327 !).

W. Ghats · Igatpuri (Blatter & Hallberg 5484 !), Khandala (McCann 5359 !); Castle Rock (Gammie 15687 !).

Deccan : Furandhar, northern foot (McCann 5041 !), Poona (Woodrow *loc. cit.* Cooke).

S. M. Country · Devarayi, 1,800 ft., rainfall 90 in. (Sedgwick & Bell 4428 !).

N. Kanara : Devmane Ghat (Kulkarni !); Jugglepet (Talbot 1568 !); Tinai Ghat (Sedgwick & Bell 3196 !); Sursi to Siddhapur (Hallberg & McCann A294 !).

Distribution : From the Central Provinces and the Konkan southwards, Ceylon.

Economic uses : Considered to be a good fodder.

Explanation of Plate 75 : *Themeda tremula* Hack.

- | | |
|---|---------------------|
| 1. Involucral spikelets (not all in one bunch). | |
| 2. Spikelet. | |
| 3. Lower invol. glume. | } Sessile spikelet. |
| 4. Upper invol. glume. | |
| 5. Lower floral glume. | |
| 6. Upper floral glume | |
| 7. Pedicelled spikelet | |

41. PSEUDANTHISTIRIA Hook. f.

Annual grasses Leaves narrow.

Panicle leafy, branches slender, filiform, each bearing a single raceme clothed by a proper spathe, the racemes subumbellate, the umbel subtended by a common spathe. Proper spathes lanceolate or linear-lanceolate, acuminate, keeled. Spikelets within each proper spathe usually consisting of 1 sessile 2-sexual spikelet with 1 pedicellate male and a second sessile 2-sexual spikelet with 2 pedicellate males. Sessile 2-sexual spikelets with a short callus; lower involuclal glume chartaceous, truncate, with inflexed margins, 4-7-nerved, the nerves apparent only towards the apex, upper involuclal glume equalling the lower, linear-lanceolate, glabrous, 3-nerved, membranous, lower floral glume small, quadrate, upper floral glume represented by the hyaline base of a long capillary geniculate awn. Lodicules cuneate. Pedicellate male spikelets on slender pedicels, lower involuclal glume thin, about 9-nerved, margins narrowly incurved, upper involuclal glume 3-nerved, lower floral glume very small, oblong. Stamens 3; anthers linear. Styles short, stigmas short exserted. Grain small.

Species 4.—Indian

Cooke has described 1 species. *P. hispida* Hook. f. We add two others: *P. umbellata* Hook. f. and *P. heterochlita* Hook. f.

I. Ligule exauriculate.

- | | |
|---|-----------------------------|
| 1. Ligule a truncate glabrous membrane, much divided to the base, the tips minutely ciliate. Sessile spikelets glabrous | 1. <i>P. hispida</i> . |
| 2. Ligule short, membranous | 2. <i>P. heterochlita</i> . |

II. Ligule auricled 3. *P. umbellata*.

1. PSEUDANTHISTIRIA HISPIDA Hook. f.

Pseudanthistria hispida Hook. f. Fl. Brit. Ind. VII (1896) 219, Cooke Fl. Bomb. II (1908) 992.

Vernacular name : Pokalya.

Etymology : *Pseudanthistria* means false *Anthistria*, a nearly related genus. *Anthistria* is derived from *antistas*, one who stands opposite or who offers resistance, referring to the stiff tough stems.

Description : Annual, stem 30-60 cm. high, rather stout, erect, glabrous and polished; nodes glabrous. Leaves 5-12.5 cm. by 3-6 mm., linear, finely acuminate, sometimes with a bristle-point, hairy on both surfaces with bulbous-based hairs, more or less subspinesulose ciliate on the margins, strongly nerved; sheaths hairy on the upper part with bulbous-based hairs, usually glabrous below, ligule a truncate glabrous membrane much divided to the base into narrow segments, the tips minutely ciliate.

Panicle elongate, simple; branches very slender, reaching 75 cm. long, often in pairs; fascicles 2 cm. broad, copiously hirsute with bulbous-based hairs, outer spathes 3.8 cm. long or more, proper spathes much longer than the racemes, all hirsute on the margins with strong bristles from tubercular bases. Sessile spikelets 4 mm. long; callus shortly bearded; lower involuclal glume 4 mm. long, oblong, truncate at the membranous ciliate apex, with narrowly infolded margins and obscure nerves, glabrous, upper involuclal glume as long as the lower, oblong, obtuse, 3-nerved with hyaline margins; lower floral glume small, quadrate; upper floral glume represented by the very acute base of the awn; awn 2.5-3.2 cm. long. Pedicellate spikelets lanceolate, hairy, pedicels finely hairy.

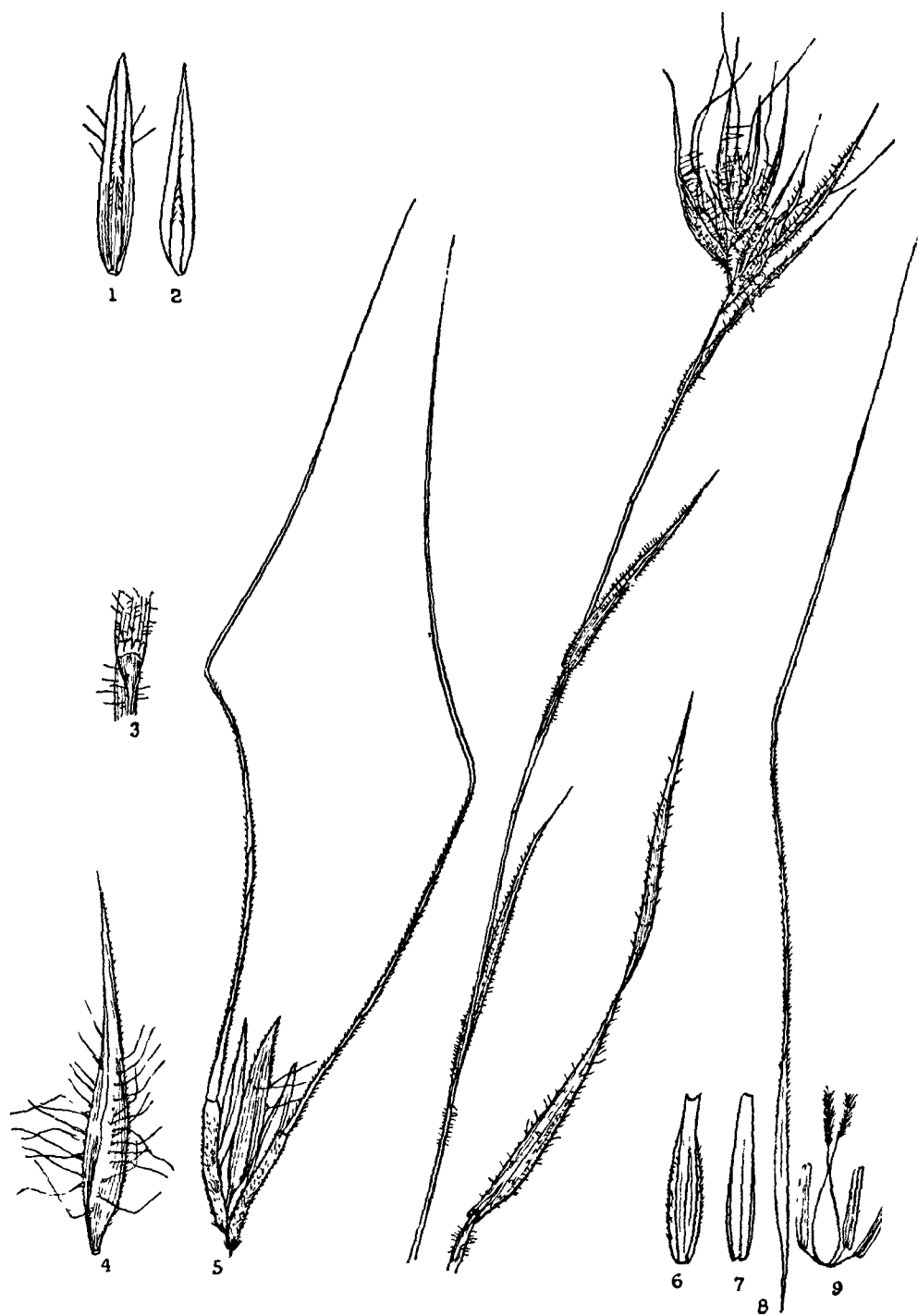
Locality : Gujarat : Surat (Garade¹).

Konkan. Dahe Forest (Ryan 705 !); Ghatkopar, Horse-shoe Valley (McCann A326 !); Sion (McCann 5247 !); Bombay, St. Xavier's College compound (McCann 4524 !); Kalyan (Woodrow).



THEMEDA TREMULA HACK.

Delin. - E. K. Bhide.



Sessile spikelets

PSEUDANTHISTIRIA HETEROCLITA HOOK F.

Delin. B. K. B.

W. Ghats Matheran (D'Almeida A329 !), Lonavla (Gammie !), Igatpuri Ghats (McCann 4343 !); Khandala, common, railway line (McCann A331 !), Panchgani (Woodrow); Castle Rock (Gammie 15634 !, McCann A328 !), Londa (Gammie 15863 !, Woodrow)

Deccan Purandhar Fort (Gammie 1010 !).

S. M. Country Derikop (Sedgwick 2061 !).

N. Kanara Brichy (Talbot 2096 !); Yellapur (Talbot 1522 !), Devmane Ghat (Kulkarni !).

Distribution : Central Provinces, W. Peninsula.

2 PSEUDANTHISTIRIA HETEROCLITA Hook f.

PLATE 76.

Pseudanthistiria heteroclita Hook. f. Fl. Brit. Ind. VII (1896) 219, Lisboa Bomb. Grasses (1896) 88.

Andropogon heteroclitus Nees Fl. Afr. Austr. (1841) 115; Steud. Syn. Pl. Glum. (1855) 389, Hack. Monogr. Androp. (1889) 400.

A. monomeros Hochst. in Hohen. Pl. Ind. Or. no 183.

Anthistiria heteroclita Roxb. Fl. Ind. I (1832) 249

Etymology : *Heteroclita* is derived from the Greek *heterochitos*, meaning otherwise declined.

Description : Stems 30-80 cm. high, geniculate, slender, terete, smooth, subsimple or branched. Leaves linear, 15-30 cm. long, 3-5 mm. broad, glabrous or more or less ciliate on both surfaces, nerves distinct, margins with long, tubercle-based hairs or nearly glabrous; sheaths much shorter than the internodes, quite glabrous, ligule short, membranous, exauriculate.

Panicles 20-30 cm. long, leafy, compound, with many shortly peduncled fascicles, fascicles of spikes about 12 mm. broad, proper spathes 7-10 mm. long, hardly longer than the spikes, towards the margin with long, tubercle-based bristles; spikes 6-8 mm. long. Sessile spikelets 3-4 mm. long, linear-oblong, hispidulous all over. Lower involucre glume furrowed. Upper floral glume awned, awn 18-24 mm. long, thin. Pedicelled spikelets lanceolate, with a few long, tubercle-based bristles, keel ciliate.

A densely tufted species. In the dry state the spathes turn reddish and are then very characteristic.—The panicles are much denser than those of the other species.

Locality : *Konkan* (Law ex Hook. f.).

Deccan : Poona (Lisboa).

Ecology : In Poona said to be common on hilly ground. Roxburgh calls it a native of newly made pasture ground.

Distribution : Bengal, Konkan, S. Kanara.

Economic uses : Used chiefly for thatching.

Explanation of Plate 76 : *Pseudanthistiria heteroclita* Hook f.

- | | | |
|------------------------------|---|----------------------|
| 1. Lower invol. glume. | } | Pedicelled spikelet. |
| 2. Upper invol. glume. | | |
| 3. Ligule. | | |
| 4. Bract. | | |
| 5. Spikelets. | | |
| 6. Lower invol. glume. | } | Sessile spikelet. |
| 7. Upper invol. glume. | | |
| 8. Upper floral glume. | | |
| 9. Stamens, grain and styles | | |

3. PSEUDANTHISTIRIA UMBELLATA Hook. f.

Pseudanthistiria umbellata Hook. f. Fl. Brit. Ind. VII (1896) 220.

Andropogon umbellatus Hack. Monogr. Androp. (1889) 401.

Description : A very slender, glabrous plant with filiform, prostrate, creeping branched stems, rooting at the nodes, stems 30-60 cm. long, compressed. Blade 2-5 cm. long, distant, linear-oblong, acute, rounded at base, sessile or short-petioled, nerves distinct, very slender, with a few scattered cilia on both surfaces, nearly smooth, sheaths shorter than the blade, often with tubercle-based hairs above, rarely glabrous, ligule passing at the sides into 2 short, herbaceous, fimbriate auricles of the sheath.

Panicle leafy, very lax, interrupted, 12-20 cm. long; fascicles of spikelets few, axillary, 6-12 mm. broad, glabrous or with a few tubercle-based cilia on simple, rarely branched capillary peduncles shorter than the leaves; lower peduncles sometimes elongate 2.5-7.5 cm. long and bearing several fascicles; outer spathes 8-25 mm. long. Spikes 3-6 in a fascicle, proper

spathe 10-12 mm. long, rather longer than the spikes, glabrous or towards the margin with a few bulbous-based hairs. Sessile spikelets 3-4.5 mm. long, linear, scaberulous. Lower involucreal glume dorsally concave, awn of upper floral glume 12-14 mm. long, very thin. Pedicelled spikelets linear-lanceolate, naked, awn 12-18 mm. long.

Much like *P. heteroclita* in appearance, but with a much laxer inflorescence. Here, too, the dry spathes are reddish. The awn often reaches 25 mm. The ligule and the bulbous-based hairs separate it from the foregoing species. One may possibly be a variety of the other.

Locality : W. Ghats : Londa (Gammie 15869 !)

N. Kanara : Burchy (Talbot 2073 !).

Distribution : Deccan and W. Peninsula, Ceylon.

TRIBE III: Paniceae.

Spikelets in usually continuous spikes, racemes or panicles. Involucreal glumes herbaceous or membranous, the lower generally smaller, very small or suppressed. Lower floral glume generally resembling the involucreal glumes in structure and nervation, the upper fertile firmer, at length rigid, often chartaceous to crustaceous, awnless, very rarely mucronate (*Urochloa*, *Allotriopsis* sp.) or finely awned (*Allotriopsis* sp.).

See key page xi.

42. SPINIFEX Linn.

Dioecious gregarious much-branched rigid littoral bushes, stem and branches woody. Leaves narrow, rigid, involute, spreading and recurved, thickly coriaceous.

Inflorescence of large terminal globose bracteate heads, with radiating spike-like racemes, the male with many spikelets on each spike, the female with one only. Male spikelets 1-2-flowered, distichous, articulate on short pedicels. Glumes 4, chartaceous, acute, strongly nerved, involucreal glumes empty; lower floral glume paleate, empty or 3-androus; upper floral glume paleate, 3-androus, the paleae of both floral glumes acuminate, as long as the glumes. Anthers linear. Female spikelets narrower than the male, erect, lanceolate, 1-flowered. Glumes acute or acuminate, strongly nerved, the lower involucreal glume the longest, lower floral glume empty, upper floral glume thin, dorsally compressed, palea linear-oblong, acuminate. Lodicules 2, large, connate below, strongly nerved. Styles long, connate below, stigmas long, penicillate, exserted at the top of the glume. Grain clavate, tipped by the long rigid style, free within the hardened glume and palea.

Species 4.—1 in India, 3 in Australia.

1. SPINIFEX SQUARROSUS Linn.

PLATE 76A.

Spinifex squarrosus Linn. Mant. (1771) 300, Lam. Ill. t. 840, Duthie Grasses N. W. Ind. (1883) 11, Benth Fl. Hongk. (1861) 415, Hook. f. Fl. Brit. Ind. VII (1896) 63; Grah. Cat. (1839) 240, Prain Beng Pl. 1168, Cooke Fl. Bomb. II (1908) 913; Haines Bot. Bih. and Or. (1924) 1010.

Stipa littorea Burm. f. Fl. Ind. (1768) 29.

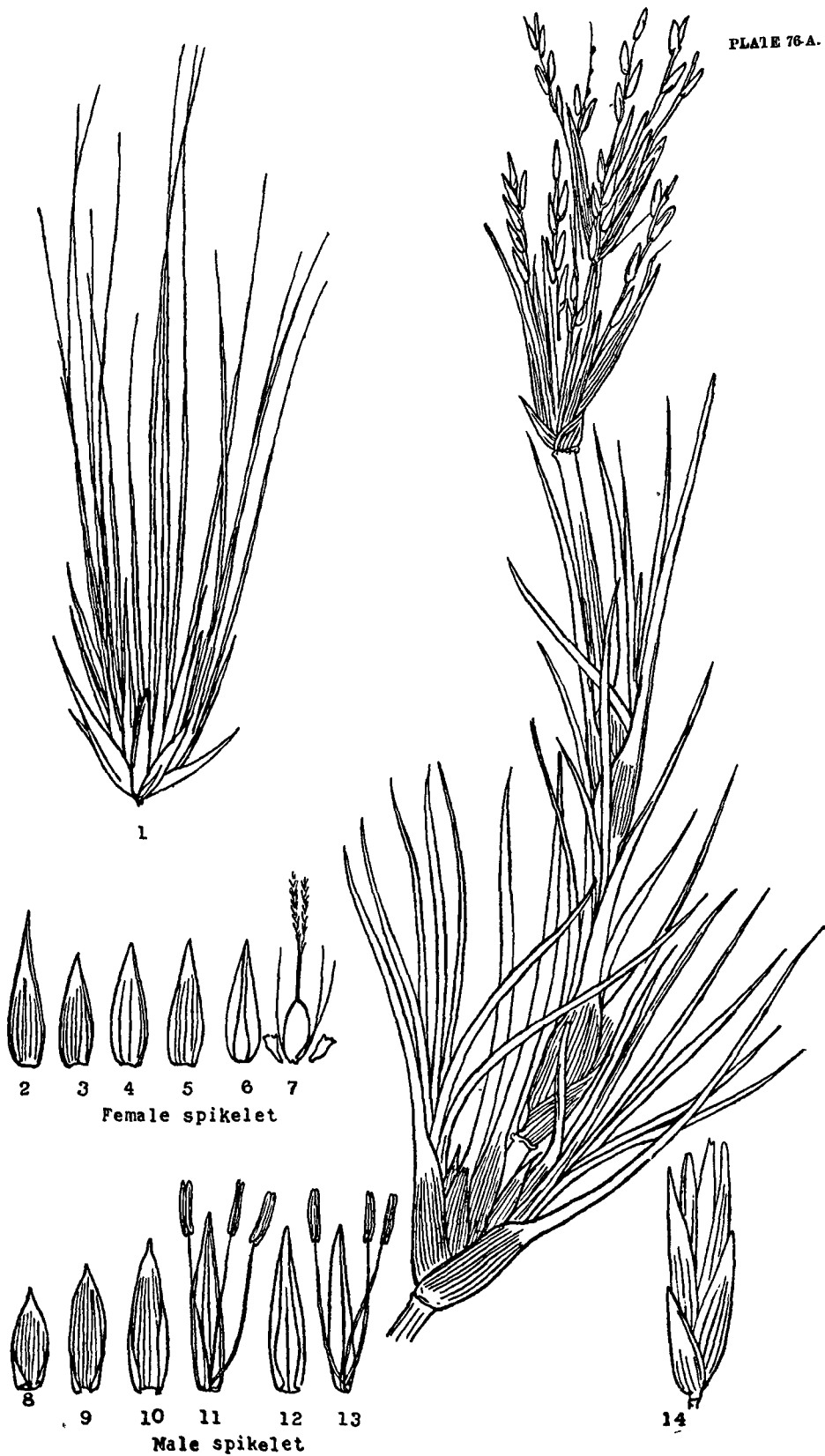
Stipa spinifex Linn. Mant. I (1767) 84.

Rheede Hort. Mal. XII, t. 75.

Etymology : *Spinifex* means one that produces spines—*Squarrosus* means rough with spreading and outstanding processes.

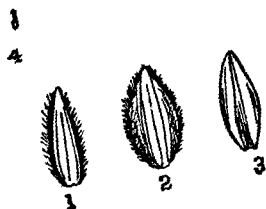
Description : A pale grey or glaucous squarrose shrub, 60-120 cm. high and broad, forming an impenetrable thicket, stem as thick as the little finger below, smooth, solid. Leaves 10-15 cm. long, spreading and recurved, smooth, tapering from the base to the tip, concave-convex, base not dilated, margins scaberulous; sheath 1.3-2.5 cm. long, smooth, with naked margins; ligule a ridge of stiff hairs.

Male inflorescence reaching 15-20 cm. diam; bracts shorter than the spikes, lanceolate, aristately pungent, flat, chartaceous, the midrib very prominent beneath; racemes (male) 2.5-7.5 cm. long, longer than the stout angular peduncles; rachis angular. Spikelets 13 mm. long, smooth, straw-coloured. Glumes 4; lower involucreal usually shorter than the upper, ovate, acute, pungent, conspicuously 7-9-nerved; upper involucreal similar but usually longer; floral glumes longer than the involucreal glumes, subequal, 5-7-nerved. Female inflorescence reaching 25 cm. diam.; bracts as in the male but smaller; peduncle thickened towards the base. Spikelets 13-17 mm. long, narrowly lanceolate. Glumes 4, lower involucreal glume oblong-lanceolate, many-nerved, scaberulous; upper involucreal glume rather shorter, 7-nerved.



SPINIFEX SQUARROSUS LINN.

Desn. R. K. Bhide.



DIGITARIA TERNATA STAPF.

Dehn: B. K.

lower floral glume empty, the palea 0 or imperfect, upper floral glume ovate-lanceolate, 5-nerved, palea shorter than the glume, acute

Locality : *Gujarat* - Near Domas (Cooke)

Konkan - Vengurla (Chibber !), Juvem (now Jehu) (McCann 4263 !), Versova (McCann 9827 !), Bandra (Blatter !), sandy shores near Bandra (Graham) Shrivardhan (Woodrow)

N Kanara - Karwar, sandy seashore (Sedgwick & Bell 5056 ' 5057 '), Kumpta (Chibber !, Woodrow), Honavar, very common (McCann !, Chibber !, Talbot 1073 !).

Ecology : Essentially a maritime species, growing on sandy shores just above high water mark. Easily recognized by its thick stiff recurved leaves, long creeping stems rooting at the nodes, and the large spherical spiny inflorescence, which may often be seen rolling about the beach in the direction of the wind.

When the seed is ripe the long head is detached and blown by the wind. A specimen was kept by us in a pot with red earth for over a year. The plant grew well enough, but it was not so robust as the shore specimens. It was greener in colour, but it never flowered. At Honavar (N. Kanara) it seemed to be in general flowering from December to January.

Distribution : India, Ceylon, Java, China.

Economic uses : A valuable sand-binding plant

Explanation of Plate 76a. : *Spinifex squarrosus* Linn

- | | | |
|---|---|------------------|
| 1. Female spikelets | } | Female spikelet. |
| 2. Lower invol glume | | |
| 3. Upper invol. glume. | | |
| 4. Lower floral glume. | | |
| 5. Upper floral glume. | | |
| 6. Palea of upper floral glume | | |
| 7. Ovary, styles and lodicules. | | |
| 8. Lower invol glume. | } | Male spikelet. |
| 9. Upper invol glume | | |
| 10. Lower floral glume | | |
| 11. Palea of lower floral glume, and stamens. | | |
| 12. Upper floral glume. | | |
| 13. Palea of upper floral glume, and stamens. | | |
| 14. Male spikelets | | |

43 DIGITARIA Hall.

Annual or perennial grasses. Leaves linear or lanceolate.

Spikelets usually 2-3-nate, in digitate or racemose spikes, jointed on the pedicel but not thickened at the base, lower floret barren, reduced to the floral glume and a very minute palea; upper floret hermaphrodite. Glumes very dissimilar, normally 4; the lower involucrel glume usually hyaline, sometimes absent or present in the same species, the upper involucrel glume membranous, 1-5-nerved or nerveless, floral glumes equal or subequal, the lower like the upper involucrel glume, usually 7-9-nerved, the nerves close, parallel straight, prominent, upper floral glume chartaceous or subchartaceous, usually 3-nerved. Palea of upper floret subequal to the glume, and of same texture, 2-nerved. Lodicules 2, minute, broadly cuneate. Stamens 3. Styles distinct, stigmas plumose, laterally exserted near the apex of the floret. Grain oblong, slightly dorsally compressed, free, but tightly enclosed between the hardened glume and the palea.

Species more than 100.—In the warm parts of the whole world, but chiefly in the Old World.

Cooke (II, 940-942) describes 6 species. All are retained in this place, but the name of *Digitaria sanguinalis* will be replaced by *D. marginata*.

A. Spikelets 2.5 mm. long or longer.

I. Spikelets with clavate hairs 1. *D. ternata*.

II. Hairs on the spikelets not clavate

1. Spikelets bearded, spikes few 2. *D. marginata*

2. Spikelets subsulky; spikes many 3. *D. pennata*.

B. Spikelets less than 2.5 mm. long.

I. Rhachis capillary, trigonous 4. *D. palucellaris*.

II. Rhachis narrowly winged.

1. Spikelets subsulky with slender (not clavellate)

hairs 5. *D. longiflora*.

2. Spikelets with clavellate hairs 6. *D. Royleana*.

1. *DIGITARIA TERNATA* Stapf.

PLATE 77.

Digitaria ternata Stapf in Dyer Fl. Cap. VII, 376, et in Fl. Trop. Afr. IX (1919) 452; Cooke Fl. Bomb. II (1908) 940.

Paspalum ternatum Hook. f. Fl. Brit. Ind. VII (1896) 17, Lisboa Bomb. Grasses (1896) 4.

Panicum ternatum Hochst. in Flora XXIV (1841) I, Intell. 19; Hack. in Oest. Bot. Zeitschr. (1901) 331.

P. Phaenocarpum var. *gracile* Nees Fl. Afr. Austr. (1841) 23.

Cynodon ternatum A. Rich. Tent. Fl. Abyss II (1851) 405.

Etymology : *Digitaria* refers to the mostly digitate inflorescence.—*Ternata* means 3-nate, alluding to the 2-3-nate pedicels.

Description : Annual; stems tufted, erect from a geniculate base, slender 15-45 cm. long, glabrous or nearly so. Leaves 5-15 cm. by 6 mm., linear-lanceolate, acute, glabrous; sheaths glabrous, striate, the mouth ciliate, ligules short, truncate, membranous.

Spikes 2-3 (or more), subdigitate, erect or spreading, silvery white, rhachis narrowly winged. Spikelets 2-3-nate, 3 mm. long, elliptic, subacute, closely appressed to the rhachis, pale; pedicels unequal, up to 2.5 mm. long, shortly hairy towards the tips. Lower involucre glume usually obsolete, upper involucre glume tender, 3-nerved, the sides villous with clavate hairs; floral glumes subequal, the lower prominently 5-nerved, densely and appressedly silky-villous with clavate hairs, the upper chartaceous, ovate-oblong, subacute, dark brown (nearly black). Occasionally long fine hairs are found on the peduncles.

Locality : Deccan · Purandhar Fort (Bhude !).

S. M. Country Belgaum (Herb. Bot. Gard. Calc.).

Distribution : India (Khasia Hills, Burma, W. Peninsula), Yunnan, tropical and S Africa.

Explanation of Plate 77 : *Digitaria ternata* Stapf.

1. Upper invol. glume.
2. Lower floral glume.
3. Upper floral glume.
4. Hair on spikelet.

2. *DIGITARIA MARGINATA* Link.

Digitaria marginata Link Hort. Berol. I, 229, Stapf in Fl. Trop. Afr. IX (1919) 439.

Description : Annual, 30 cm. to 1 m. high. Stems tufted, usually ascending from a geniculate or prostrate base, simple or branched from the lower nodes, glabrous, few- to many-noded. Leaves 5-15 cm. by 4-8 mm., linear or linear-lanceolate from a slightly contracted and rounded base, acute, flat, flaccid, glabrous or sparingly hairy particularly towards the mouth, margins finely cartilaginous, rough and often crisp, midrib very slender, whitish; sheaths thin, subherbaceous, loose, glabrous, or more or less beset with spreading tubercle-based hairs often forming a loose beard at the base; ligules truncate, membranous, up to over 1 mm. long.

Spikes mostly 4-9, sessile, subdigitate, solitary or 2-3-nate on a short, scaberulous common axis, erect or spreading, rather slender, strict or slightly flexuous, 5-15 cm. long, often finely pubescent at the base; rhachis almost straight, triquetrous, lateral angles winged, herbaceous, scabrid, internodes up to more than 2 mm. long. Pedicels 2-nate, one very short, the other up to 1.5 mm. long, angular, scabrid. Spikelets appressed, lanceolate, acutely acuminate, 2-4 mm. long, pale greenish, rarely tinged with purple, variously hairy, rarely quite glabrous. Lower involucre glume an ovate, obtuse to subacute membranous scale, usually not over 0.3 mm. long, sometimes obsolete or quite suppressed, upper ovate-lanceolate, acute, equalling or considerably exceeding half of the upper floral glume, rarely distinctly shorter, 3-nerved, with fine lines of hairs between the nerves and along the margins, rarely quite glabrous. Lower floral glume corresponding in outline and size to the spikelet, firmly membranous, 7-nerved, rarely quite glabrous, usually with fine lines of hairs between the inner side-nerves (of each half) and along the margins; upper floral glume oblong-lanceolate, acutely acuminate, almost as long as the spikelet, thinly chartaceous, pale or slightly purplish, brownish when ripe. Grain oblong, planoconvex, whitish scutellum less than half the length of the grain.

This species is not identical with *Paspalum sanguinale* Lamk. of the F. B. I. or with *Digitaria sanguinalis* Scop in Cooke's Flora or in Haines' Bot. of Bihar and Orissa. *D. sanguinalis* Scop. (*sensu stricto*) is a plant of S. Europe and has not been found either in India or tropical Africa, as was pointed out by Pilger (in Engl. Jahrb. XXX, 118) and Stapf. Most of the numerous synonyms given by Hook. f. in the F. B. I. would have to be mentioned under the different varieties. Here we have to deal only with one variety which was described by Cooke as *var. ciliaris* Pram and which was called *var. fimbriata* by Stapf.



DIGITARIA MARGINATA LINK VAR *FIMBRIATA* STAPF.

Delin: B. K. Bhida.



DIGITARIA PENNATA CHIOV.

Dalm: H. K.

VAR FIMBRIATA Stapf.

PLATE 78.

Digitaria marginata var. *fimbriata* Stapf l.c. 440.

D. fimbriata Link Hort. Berol. I, 226.

D. commutata Schult. Mant. II, 262.

D. chrysoblephora Fig. & De Not. in Mem. Acc. Tor. ser. II, XIV, 364.

D. sanguinalis var. *ciliaris* Rendle in Cat. Afr. Pl. Welw. II, 163, and in Journ. Linn. Soc. Bot. XL, 228.

D. sanguinalis var. *ciliaris* Prain Beng. Pl. 1181, Cooke Fl. Bomb. II (1908) 940.

Panicum ciliare Retz. Obs. IV (1786) 16; Kunth Enum. I, 82; Roxb. Fl. Ind. I (1832) 290; A. Rich. Tent Fl. Abyss. II (1851) 360; Dalz. & Gibs. Fl. Bomb. (1861) 290; Duthie Indig. Fodder Grasses (1886) t. 9

P. fimbriatum Presl Rel. Haenk. I (1830) 298; Kunth Enum. I, 81

P. sanguinale var. *ciliare* Franch. Contr. Fl. Congo Franc. 46

P. sanguinale var. *blepharanthum* Hack in Durand & Schintz Consp. Fl. Afr. V, 762.

P. sanguinale var. *macrostachyum* Hack l.c. 763.

Paspalum sanguinale var. *ciliare* Hook f Fl. Brit. Ind. VII (1896) 15.

Vernacular names : Tara, Shikaol or Arotaro, Chansarieu, Taro, Modhan, Fakria, Kurad, Suka, Revga, Dinohi, Shikar koli, Kalam hullu, Shumpigyan hullu.

Etymology : *Fimbriata* refers to the fringes on each side of the spikelet at maturity.

Description : Upper involucre glume usually much exceeding the middle of the fertile floret and frequently equalling $\frac{1}{2}$ of its length. Indumentum of spikelets uniform or more often more or less varied in the same inflorescence, hairs of the upper involucre glume and lower floret partly in fine lines, all of one kind, very fine, thin-walled, obtuse-tipped, partly more thick-walled with slightly clavate tips, and up to 1 mm. long, spreading out at maturity and forming a rigid double fringe on each side of the spikelet, the inner fringe often mixed with a varying number of tubercle-based acute yellow bristles which ultimately also spread out at right angles.

It is well to remember what Stapf says in a note, l.c. 441 "The peculiar indumentum of the spikelets, which in the mature state leads to the formation of spreading fringes, may extend to all spikelets alike or it may be, at least in its perfect development, confined to the long-pedicelled member of each pair of spikelets or only to some of them, in which case the indumentum of the fringeless spikelets approaches more or less that of var. *Linkii*." Var. *Linkii* Stapf is Hooker f.'s var. *commutatum* of *Paspalum sanguinale* in F. B. I. VII, 15.

Locality : Sind Sanghar (Sabnis B903 !), Mirpurkhas, in cultivated fields (Sabnis B1209 !); Bughar, Indus River (Blatter & McCann D686 !), Ghulamalla, garden (Blatter & McCann D687 !).

Cutch (Blatter 8742 !).

Gujarat - Ahmedabad (Herb. Econ. Bot. Poona !).

Khandesh N. slope of Chanseli (McCann 9535 !); Bor, Tapta Island, on sand and mud (Blatter & Hallberg 5463 !); Muravat, Tapta bank (Blatter & Hallberg 3839 !), Umalla (Blatter & Hallberg 5178 !), Amalner (Blatter & Hallberg 4443 !), Sumit (Blatter & Hallberg 5188 !); Bor, Bori River (Blatter & Hallberg 5213 !); Dadgaum (McCann 9531 !).

Konkan - Victoria Gardens, Bombay (McCann 9831 !); Malabar Hill (McCann 4300 !); very common throughout the Islands of Bombay and Salsette (McCann !); Versova, Salsette (McCann 4308); Parsik, railway line (McCann 9530 !), Bassein (McCann 4485 !); Ahbaga, sandy shore (Ezekiel !).

W. Ghats Igatpuri (9833 !), Khandala (McCann 3650 !); Panchgani, Maratha Well (Blatter & Hallberg B1233 !)

Deccan - Purandhar (McCann 5606 !); Chattarshimji (Ezekiel !); Pashan (Gammie !), Deolah (Blatter & Hallberg 4556 !); Gangapur (Blatter & Hallberg 4581 !).

S. M. Country Haveri, dry ground, compound of P. W. D. (Talbot 2228 !), Dharwar (Sedgwick !), Belgaum (Herb. Bot. Gard. Calc.).

N. Kanara - Karwar (Talbot 1294 !); Halyal (Talbot 2153 !), Kulgi (Talbot 2279 !).

Ecology : Common in cultivated soil, often a bad weed in lawns

Distribution : Tropics of both hemispheres, rarely found beyond the tropics.

Economic uses : Considered to be a good fodder grass.

Explanation of Plate 78 : *Digitaria marginata* Link var. *fimbriata* Stapf.

1. Lower and upper floral glumes of lower spikelet.
2. Part of rachis showing lower and upper spikelets in position
3. Upper invol. glume.
1. Lower floral glume.

5. Upper floral glume.
6. Palea of upper floral glume
7. Stamens, grain and styles.

3. DIGITARIA PENNATA CHIOV.

PLATE 79

Digitaria pennata Chiov. in Result. Scient. Miss. Stefanni Paoli I, 183, Cooke Fl. Bomb. II (1908) 941, *erronee ascribens nomen Hookero f.*, Stapf in Fl. Trop. Afr. IX (1919) 472

Panicum pennatum Hochst. in Flora XXXVIII (1855) 197, Schweinf. in Bull. Herb. Boiss. II, App. II, 18.

Paspalum pennatum Hook. f. Fl. Brit. Ind. VII. (1896) 16

Description : Stems 60 cm. long, tufted, leafy. Leaves 2.5-15 cm. by 3-6 mm., linear or linear-lanceolate, finely acuminate, glabrous or sparsely hairy, distantly ciliate with long, fine, bulbous-based hairs, sheaths long, striate, glabrous or with a few scattered hairs; ligule long, oblong, membranous

Spikes several, radiating, 7.5-15 cm. long, rachis very slender, trigonous with numerous long cilia. Spikelets erect, solitary or 2-nate, 3 mm. long, narrowly lanceolate, acute, subsilky. Glumes normally 4; lower involucrel glume minute, ovate, acute (rarely absent), upper involucrel glume lanceolate, acute, membranous, lower floral glume similar to the upper involucrel glume, 3-5-nerved, upper floral glume chartaceous, lanceolate, acuminate, nearly equal to the lower

Locality : Sind. Karachi (Stocks teste Hook. f.), Jemadar ka Landa, near Karachi (Stocks), Tatta, Kullian Kote (Blatter & McCann D684 !), Tatta (Blatter & McCann D685 !).

Kathawar Porbandar (Bhude !), Morvi (Woodrow)

Distribution : Baluchistan, tropical Arabia and Africa.

Explanation of Plate 79 : *Digitaria pennata* Chiov.

- 1 Upper invol. glume.
- 2 Lower floral glume
- 3 Upper floral glume.
- 4 Palea of upper floral glume.
- 5 Grain and styles
6. Spikelet, on rachis.

4. DIGITARIA PEDICELLARIS PRIN.

PLATE 80.

Digitaria pedicellaris Prain Beng. Pl. (1903) 1181, Cooke Fl. Bomb. II (1908) 941, Haines Bot. Bih. and Or. (1924) 1009.

Paspalum pedicellare Trin. ex Steud. Nom. ed. 2 (1841) 272; Hook. f. Fl. Brit. Ind. VII (1896) 19.

P. pedicellatum Nees & Arn. in Wight Cat. 2310; Duthie Grasses N. W. Ind. (1883) I.

Milium sanguinale Roxb. Fl. Ind. I (1832) 315 (excl. syn. Burm.).

Description : Stems tufted 15-45 cm. long, leafy. Leaves 5-15 cm. by 2.5-4 mm., linear-lanceolate, finely acuminate

Spikes 3-10, alternate, racemously arranged on a very slender peduncle, suberect or spreading, 2.5-10 cm. long, rachis capillary, trigonous, pedicels 1-3 mm. long, those of the upper spikelet longer than the spikelet. Spikelets 2-5-nate, 1.2-1.6 mm. long, elliptic, acute. Lower involucrel glume obsolete, upper involucrel glume elliptic, acute, very slightly hairy, 5-nerved, thinly membranous (almost hyaline), lower floral glume similar, upper floral glume elliptic, acuminate, thickly membranous, pale.

Locality : Konkan Thana (McCann 8725 !), Sion (St. X. C. Herb.), Mulgaum (McCann 3663 !)

Deccan Chattarshinji Hill, Poona (Ezekiel !).

S. M. Country Hubli, 2,000 ft., rainfall, 30 in. (Sedgwick & Bell 4229 !).

Distribution : Throughout India.

Explanation of Plate 80 : *Digitaria pedicellaris* Prain.

- 1 Part of rachis.
- 2 Spikelet.
- 3 Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.



DIGITARIA PEDICELLARIS PRAIN.

Desm: R. K. Bhude.



DIGITARIA LONGIFLORA PERS.

Delin: R. K. Bl

5. *DIGITARIA LONGIFLORA* Pers.

PLATE 81.

Digitaria longiflora Pers. Syn I (1805) 85 (*non Trin*), Cooke Fl. Bomb II (1908) 941, Stapf in Fl. Trop Afr. IX (1919) 469, Haines Bot Bih and Or (1924) 1008.

D. Pseudo-Durva Schlechtend. in Linnaea XXVI, 458.

D. linearis Schult. f. Mant. II, 264 (*non Roem & Schult.*).

D. tenuiflora Stapf in Dyer Fl. Cap VII, 380 (*non P. Beauv.*).

Paspalum longiflorum Retz Obs. IV (1786) 15 (*non Trin*); Baker Fl. Maurt (1877) 431; Hook. f. Fl. Brit. Ind. VII (1896) 17 (*partim*).

P. brevifolium Fluegge Gram. Monogr (1810) 150

P. Pseudo-Durva Nees Fl. Afr Austr (1841) 21.

P. filiculme Nees ex Thw. Enum. Pl. Zeyl (1864) 358.

Panicum longiflorum Gmel. Syst. 158.

P. parvulum Trin Pan Gen. 117

P. argyrotrichum Durand & Schintz Consp. Fl. Afr. V, 741 (*non Anders.*).

Milium filiforme Roxb Fl. Ind I (1832) 314

Digitaria tenuiflora P. Beauv. given as a synonym by Cooke seems to be a different species. It is apparently a perennial of erect habit and with long narrow leaves.

Description : Annual or perennial, stems many, tufted, slender, creeping and rooting, or ascending or suberect, 15-45 cm long, glabrous, with many nodes, often branched, leafy. Leaves 1.3-10 cm long, linear-lanceolate, acute, spreading, flat, or, in short-leaved states, stiff and pungent, glabrous (rarely hairy), sheaths smooth or hairy, ligule very short, membranous.

Spikes 2-5, terminal, very slender, 2.5-10 cm. long, erect or spreading, rhachis narrowly winged, glabrous, pedicels 2- (rarely 3-) nate, unequal, short. Spikelets 1.2-1.6 mm. long, appressed to the rhachis, elliptic, obtuse, acute or subacute, pale or purplish, glabrous, or subsilky with wrinkled hairs. Lower involucre glume 0 or rudimentary; upper involucre glume 3-7-nerved, lower floral glume similar and subequal to the upper involucre glume, 3-5-nerved, upper floral glume subchartaceous, ovate-oblong, slightly shorter than the lower, pale brown, smooth; palea with inflexed (not auricled) flaps.

Locality : Deccan Deolali (Blatter & Hallberg 9835!).

S. M. Country Dry uplands, Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 2653!); Belgaum (Herb Bot Gard. Calc.)

W. Ghats : Londa (Bhide!), Panchgani (McCann 2799!).

N. Kanara : Halyal (Talbot 2310!).

Distribution : Throughout India, Ceylon, tropical and S. Africa, Madagascar, Mascarenes, Malaya.

Explanation of Plate 81 : *Digitaria longiflora* Pers.

- 1 Part of rhachis.
- 2 Upper invol. glume
3. Lower floral glume.
- 4 Upper floral glume.
5. Palea of upper floral glume.
- 6 Stamens, ovary and styles.
- 7 Ligule.

6. *DIGITARIA ROYLEANA* Prain.

PLATE 82

Digitaria Royleana Prain Beng Pl. (1903) 1181, Cooke Fl. Bomb. II (1908) 942, Haines Bot. Bih. and Or. (1924) 1008.

Paspalum Royleanum Nees ex Thw. Enum. Pl. Zeyl. (1864) 358; Hook. f. Fl. Brit. Ind. VII (1896) 18; Trin. Fl. Ceyl. V, 125, Duthie Grasses N. W. Ind. (1883) 1.

Panicum puberulum Kunth Rev. Gram. I (1829) 32, Enum. Pl. I (1838) 81.

Digitaria puberula Link Enum. Hort. Berol. I (1827) 223.

Milium ovatum Heyne ex Wall Cat. no. 8752.

Description : Perennial, stems 30-60 cm long, tufted, slender, erect, leafy. Leaves 10-23 cm. by 3-6 mm., erect, linear, acuminate, flat, glabrous or sparsely ciliate towards the base; sheaths glabrous or with few scattered hairs; ligule short, rounded, membranous.

Spikes 3-15, erect, subdigitate or alternate, 7.5-15 cm. long, on the top of a slender peduncle, very slender, rhachis filiform, very narrowly winged, glabrous; pedicels often much longer than the spikelets, usually setulose with long hairs. Spikelets secund, 1.2-1.6 mm. long, broadly elliptic, tomentose with minute clavellate hairs. Lower involucre glume 0 or reduced to a tuft of hairs, upper involucre glume usually much smaller than the floral glumes or reduced to

hairs; lower floral glume thinly membranous, broadly elliptic, strongly 5-nerved, as long as and broader than the upper floral glume, upper floral glume thinly coriaceous, ovate, acute, striolate, polished and shining, dark brown or nearly black; palea with inflexed flaps

Locality: *Konkan* · St. Xavier's College compound (McCann 4533 !), Mulgaum, Salsette (McCann 9523 !)

W Ghats · Khandala (McCann 3651 !), Lonavla (Herb. Econ Bot. Poona !); Panchgani, slopes below Third Tableland (Blatter & Hallberg B1229 !); Panchgani, Maratha Well (Blatter & Hallberg B1224 !, B1281 !), Mahabaleshwar, in a garden, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4584 !); Suvasni Ghat (Woodrow).

Deccan · Purandhar Fort (Bhide !), Lina Hill, Nasik Dist. (Blatter & Hallberg 4542 !); Lohagad, way up (McCann 9512 !); Katraj Ghat, 11 miles S. E. of Poona (Bhide !).

S. M. Country Dharwar, 1,600 ft., rainfall 34 in (Sedgwick 2843 !), Belgaum (Herb. Bot. Gard. Calc. !).

N Kanara (Talbot !)

Ecology: Very abundant in high level ricefields in the Carnatic, but not confined to hilly districts.

Distribution: Hilly districts throughout India, Ceylon apparently not in tropical Africa.

Explanation of Plate 82: *Digitaria Royleana* Prain.

1. Part of rachis with spikelets
2. Upper invol glume.
3. Lower floral glume
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.

44. ALLOTERPIS Presl emend. Hitchcock

(*Axonopus* Beauv.)

Stapf (Fl Trop Afr., 483) explains why he adopts *Alloteropsis* Presl as emended by Hitchcock "As Hitchcock (Contrib. U. S. Nat. Herb. XII, 210) has pointed out, Presl's description and analyses of *Alloteropsis* are based on a composition of a Panicoid and an Andropogonoid grass, whilst the original in Presl's herbarium is undoubtedly the plant described here as *A. semialata*, and so is also the habit figure (1) in Presl's plate. The genus is therefore accepted here with Hitchcock's emendation.

"Another member of this genus, *A. cymicina*, was included by Palisot de Beauvois (Agrost. 12) in his genus *Axonopus* under its earliest synonym *Milum cymicinum* and as "*A. cymicinus* ?" on p. 154, and this led J. D. Hooker (Fl. Brit. Ind. VII, 64) to use the name *Axonopus* in preference to *Alloteropsis*, a view which was adopted by myself in Fl. Cap. VII, 418. From P. Beauvois' diagnosis, however, and from the fact that he quotes in the first place "*Milum compressum*" as example for *Axonopus*, there can be no doubt that he had primarily *Milum compressum* in view when establishing his genus *Axonopus* and it is in that sense that the genus is understood in this work. *A. cymicina* also forms the basis of another genus, *Corodochoa*, Nees in Edinb. New Phil. Journ. XV, 381. A. Chase (in Proc. Biol. Soc. Washington, XXIV, 157) maintains this genus as distinct from *Alloteropsis*, and I followed her when drawing up the key of the genera of Tropical African grasses (p. 13); but I have since come to the conclusion that the species referable to these two groups are so similar in the peculiar structure of their spikelets that they are better merged into one genus for which *Alloteropsis* has priority over *Corodochoa*."

We have, therefore, to add the characteristics of the genus as given by Stapf

Perennial or annual. Leaf-blades flat or more or less convolute, ligules membranous ciliate or ciliolate, short or reduced to a mere rim.

Racemes sessile or peduncled, often more or less compound towards the base, digitate or subdigitate on a more or less elongated common axis. Spikelets ovate or elliptic to lanceolate-oblong, acute or acuminate, mostly awned, slightly or conspicuously compressed from the back, falling entire from the pedicels, 2-nate or fascicled, subsecund and abaxial on the triquetrous rachis of more or less spiciform racemes. Lower floret usually male, upper hermaphrodite. Involucral glumes unequal, lower smaller, membranous, to hyaline, 3-1-nerved, very acute, often mucronulate, upper equal or subequal to the spikelet, membranous to chartaceous, 5-nerved, with the outer nerves submarginal, densely ciliate along them. Lower floral glume resembling the upper involucral glume, but ciliate, palea short, deeply 2-fid with conspicuously auricled flaps, upper floral glume chartaceous, glabrous, delicately ciliate up-



DIGITARIA ROYLEANA PRAIN.

Desm: R. K. Bhude.



ALLOTEROPSIS CIMICINA STAPF

Delin: B. K. B

wards, 5-nerved, produced into a straight awn or mucronate, palea equal to the glume, 2-keeled, with broadly auricled flaps. Lodicules 2, broadly cuneate. Stamens 3. Styles distinct, stigmas laterally exerted. Grain enclosed by the glume and palea, elliptic-oblong, dorsally much compressed, scutellum about half the length of the grain, hilum basal, punctiform.

Species about 5. In the tropics and the warm temperate zone of the Old World, 3 in India. In the Bombay Presidency there is only one species.

1. *ALLOTROPIS CIMICINA* Stapf.

PLATE 83.

Allotropis cimicina Stapf in Fl. Trop. Afr. IX (1919) 497; Haines Bot. Bih. and Or. (1924) 1009.

Melinis cimicinum Lamm. Mant. Alt. (1771) 184

Panicum cimicinum Retz Obs III (1783) 9, Roxb. Fl. Ind I (1832) 291, Steud. Syn. Pl. Glum. I (1855) 43.

P. conjugatum Dalz. & Gibs. Bomb. Fl (1861) 291

Asynopus cimicinus (?) Beauv. Agrost. (1812) 12, Hook f Fl. Brit Ind. (1896) VII, 64, Hook. f in Trin. Fl. Ceyl. V, 166; Cooke Fl. Bomb. II (1908) 925

Urochloa cimicina Kunth Rev. Gram. I (1829) 31, t. 103, Dalz. & Gibs Bomb. Fl. I c 289.

Coridochloa cimicina Nees in Edinb. N. Phil. Journ. XV (1833) 381; A. Chase in Proc. Biol. Soc. Wash. XXIV, 158.

C. fimbriata Nees ex Wight Cat. no. 1656, Aitchis Cat. Panjab Pl. (1869) 158.

Vernacular name : Sumn.

Etymology : *Allotropis* is derived from the Greek *allos* (another), belonging to another, foreign, inconsistent, and *opsis*, a countenance, appearance, therefore a plant having the appearance of another. *Cimicina* is the adjective formed from *cimex*, a bug.

Description : A tufted grass; stems 30-60 cm long, erect, or decumbent at the base; nodes hairy. Leaves 2.5-7.5 cm by 10-16 mm, ovate-lanceolate from a broad cordate base, acute, flat, glabrous or hairy, ciliate on the margins with stiff bulbous-based hairs, sheaths glabrous or hairy, ligule of short hairs.

Inflorescence in spike-like racemes, 3-10 on the top of a slender smooth glabrous peduncle 5-15 cm. long, with sometimes a fascicle of 2 or more lower down on the peduncle, peduncle naked in the lower part, rachis of raceme angular, scaberulous, slender. Spikelets (including a slender scaberulous awn about 3 mm long) 6-8 mm long, subsecund, solitary or 2- (rarely 3-) nate, erect, readily disarticulating from the pedicel, pedicels unequal, scaberulous, cupular at the tip. Glumes 4, lower involucrel glume rather more than 2.5 mm long, narrowly ovate-lanceolate, amstately acuminate, hyaline, with 3 slender green nerves, of which the 2 lateral arch to join the midrib below the tip, upper involucrel glume 5 mm. long, broadly ovate, cuspidately acuminate, thinly membranous, 5-nerved, the 3 central nerves slender, green, the 2 lateral nerves marginal, bristly with long coarse purplish hairs which reach 2.5 mm. long, lower floral glume 4 mm. long, ovate-oblong, obtuse, male, paleate, the palea small, 2-partite, upper floral glume 6 mm. long (or more), including the awn, which is nearly as long as the glume, ovate, acute, coriaceous, often faintly ciliate and with slightly incurved margins, palea as long as the glume, coriaceous, elliptic-oblong, subobtuse.

Locality : *Konkan* : Sewri (McCann 3586 !), Mulgaum (McCann 3654 !).

W. Ghats . Panchgani (Hallberg !).

Deccan . Sinhgad forests (Blide !); Lana Hill, Nasik Dist (Blatter & Hallberg 4583 !).

S. M. Country . Dharwar (Sedgwick 2032 !, Woodrow), Gokak (Shevade !); Badami (Woodrow).

N. Kanara : Halyal (Talbot 2294 !); Kulgi (Talbot 2434 !).

Ecology : Growing chiefly on ground that has lately been under cultivation. A sporadic grass. Very common in the Carnatic.

Distribution : Tropical Africa, Madagascar, throughout India to Java.

Explanation of Plate 83. *Allotropis cimicina* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

45 PSEUDECHINOLAENA Stapf.

Annual Culms very slender with a prostrate rooting base. Leaf-blades lanceolate, soft.

Spikelets very irregularly armed or quite unarmed, obliquely ovoid, laterally compressed and mostly conspicuously gaping, falling entire from the pedicels, binate or more often sub-solitary or solitary, second on the flat or subtriquetrous slender rhachis of spiciform racemously arranged racemes. Involucral glumes herbaceous, of about the same length and almost as long as the spikelet, or the lower distinctly shorter, heteromorphous. Lower more or less flat, 3-nerved, smooth or almost so; upper boat-shaped, gibbous downwards, 7-nerved, with longitudinal rows of more or less transparent spots between the nerves and with or without shorter or longer, stout, hooked hairs or bristles from the centre of the spots. Lower floret male or barren, as long as the spikelet; glume oblong-lanceolate with a minutely truncate tip, laterally compressed but rounded on the back, chartaceous, with membranous margins and a delicate hyaline area at the base, smooth, palea almost as long as the glume, more or less convolute, faintly 2-nerved. Upper floret hermaphrodite, shorter than the lower; glume broad-lanceolate to oblong, subacute, very convex on the back, chartaceous, faintly 5-nerved, palea similar to the valve in texture, tightly clasped by it when mature. Lodicules 2, cuneate. Stamens 3. Styles free at the base, capillary; stigmas plumose, subterminally exserted. Grain oblong in face-view, semi-obovate in profile, back very convex; scutellum elliptic, almost half the length of the grain; hilum subbasal, punctiform.

Species 1.—Tropics of the whole world.

The only species of this genus was originally described under *Echinochloa*. This genus, however, is exclusively American which, according to Stapf, differs from *Pseudechinolaena* in many ways, "as in its densely packed spikes, the many-nerved lower glume, the 'eglandular' always unarmed upper glume, the uniformly papery 5-nerved lower valve [lower floral glume] which is accompanied by a sharply 2-keeled flat valvule [palea], the basally appendaged fertile valve [upper floral glume] and the acutely auricled or toothed flaps of its valvule [palea], and finally the flatter grain which is marked with a panduriform line on the face extending through its full length and possesses a slender linear hilum."

1. PSEUDECHINOLAENA POLYSTACHYA Stapf.

Pseudechinolaena polystachya Stapf in Fl. Trop. Afr. IX (1919) 495.

Echinochloa polystachya H. B. & K. Nov. Gen. & Sp. I, 119, VII, t. 679; Kunth Enum. I (1838) 172, Suppl. 127, Hitchcock Mex. Grass. in Contr. U. S. Nat. Herb. XVII, 223, A. Chase in Proc. Biol. Soc. Wash. XXIV, 118.

E. Trinii Montzi Syst. Verz. Zoll (1845-6) 102.

Lappago athena Spreng. Neue Entdeck. III, 15.

Panicum uncinatum Raddi Agrost. Bras. 41; Trin. Gram. Panic. 240, and Sp. Gram. Ic. t.

216; Kunth Enum. I (1838) 172, Steud. Syn. Pl. Glum. I (1855) 60; Hook. f. Fl. Brit. Ind. VII (1896) 58, Trin. Handb. Fl. Ceyl. V, 160.

P. glandulosum Nees ex Trin. Gram. Pan. 174, and Agrost. Bras. 128.

P. nemorosum, β Trin. l. c.

P. heteranthum Link. Hort. Berol. I, 212; Kunth l. c. 92.

P. echinatum Willd. ex Doell. in Mart. Fl. Bras. II, II, 193.

P. polystachyum K. Schum. in Engl. Pf. Ost-Afr. C. 103 (*non aliorum*).

Etymology: *Pseudechinolaena* means false *Echinochloa*, a genus of grasses, *echinolaena* is derived from the Greek *echinos*, a hedgehog and *laena*, a double woollen cloak worn over the pallium or the toga for warmth, alluding to the shape of the spikelet.

Description: Perennial. Culm about 60 cm. long, of which about half is rising above ground, and the other half prostrate, giving off numerous short or long branches, growing into secondary culms, their bases often finely filiform, all many-noded and rooting from the nodes near the ground, erect or ascending portion above the last branch 5-8-noded with as many perfect leaves, internodes exserted, terete, glabrous. Leaf-blades lanceolate from a shortly contracted or rounded and usually slightly oblique base, acutely acuminate, from less than 12 mm. (lowest) to up to over 6 cm. by 4-12 mm., dark green, glabrous, with scattered or very fine stiff hairs above, finely and appressedly pubescent underneath, midrib very fine, whitish or straw-coloured, lateral nerves fine, numerous, crowded. Sheaths tight, terete, strongly striate, more or less appressedly hairy and ciliate along the margin or only ciliate. Ligules thin, membranous, rounded or truncate, ciliate, under 2 mm. long.

Inflorescence up to over 15 cm. long, with up to 6 or even 8 racemes, mostly much shorter and with fewer racemes, occasionally reduced to a solitary raceme; common axis subterete, almost smooth, glabrous 0.5 mm. diam.; racemes appressed to the common axis or obliquely spreading, the lowest up to 35 mm. long, sometimes quite short; rhachis filiform, triquetrous, minutely puberulous; pedicels filiform, angular, pruinously scaberulous, lateral up to 2 mm.

long, often much shorter. Spikelets often unequally developed, the lower of each raceme or the lower (secondary) of each pair often reduced in a varying degree, if perfect about 4 mm. long. Involucral glumes dull or brownish green, lower oblong- to ovate-lanceolate, acuminate, as long as the spikelet or shorter, glabrous or sparingly and minutely scaberulous, nerves stout, upper semiovate in profile, acute with the tip laterally compressed, armature very variable in the same raceme, from short asperities to sharply pointed hairs bent at a right angle near the base, then appressed and directed forwards, or short or long (to over 1 mm.) cylindric or stoutly subulate protuberances bearing terminally at a right angle a fine very sharp bristle pointing mostly forwards, outermost lateral nerves marginal. Lower floral glume pale, greenish only at the tip, very delicately scaberulous, hyaline basal area oblong, 1 mm. long; upper slightly over 2 mm. long, straw-coloured, smooth, shining. Grain 1.6 by 0.6 mm., palea.

Locality : *N Kanara* Siddhapur, evergreen forest (Talbot 1081!).

Ecology : A shade-loving forest grass.

46. *ERIOCHLOA* H. B. & K

Annual or perennial grasses. Leaves flat, lanceolate or ovate-lanceolate.

Spikelets 1-flowered, aristulate, secund on the spiciform branches of a raceme or panicle, the base thickened and articulate on the thickened apex of the short pedicel. Glumes 3; lower involucral glume (of *Panicum* etc.) absent; upper involucral glume subequal to the lower floral glume; upper floral glume paleate, rather shorter than the lower, apiculate, hardening in fruit. Lodicules truncate. Stamens 3, anthers linear. Styles 2, free; stigmas plumose, subapically exerted. Grain oblong, free between the hardened glume and the palea.

Species about 25 — In the warm parts of the whole world.

Cooke describes one species — *E. polystachya* H. B. & K. which name has to cede to *E. ramosa* O. Kuntze.

1. *ERIOCHLOA RAMOSA* O. Kuntze

PLATE 84.

Eriochloa ramosa O. Kuntze Rev. Gen. Pl. II (1891) 775; Hack. in Bull. Acad. Int. Bot. XVI, 19; Merrill in Philipp. Journ. Sc. I, Suppl. 348; Stapf in Fl. Trop. Afr. IX (1919) 498; Haines Bot. Bih. and Or. (1924) 1006.

E. annulata Kunth Rev. Gram. I (1829) 30, and Enum. I (1838) 73; Duthie List Grass. N. W. Ind. (1883) 2; Benth Fl. Hongk. (1861) 409, Hack. in Engl. Jahrb. VI, 233.

E. polystachya Duthie Ill. Indig. Fodder Grasses Ind. (1886) t. 41; Fodder Grasses N. Ind. (1888) 2; Hook. f. Fl. Brit. Ind. VII (1896) 20, Cooke Fl. Bomb. II (1908) 944; Rendle in Journ. Linn. Soc. Bot. XXXVI, 320 (non H. B. & K.).

Milium ramosum Retz. Obs. VI (1791) 22, Roxb. Fl. Ind. I (1832) 317, Griff. Notul. III, 15; Ic. Pl. Asiat. t. 139, fig. 60.

Agrostis ramosa Poir. Encycl. Suppl. I, 257.

Paspalum annulatum Fluegge Monogr. Pasp. 133; Trin. Sp. Gram. Ic. t. 133.

Helopus laevis Trin. ex Spreng. Neue Entdeck. II, 49, fig. 4.

H. annulatus Steud. Syn. Glum. I (1855) 99 (non Nees).

Pipathervum annulatum Presl Rel. Haenk. I (1830) 221 (non Raddi).

NOTE — Massee Honda in his *Revisio Graminum Japoniae* (Bot. Mag. Tokyo 37 (1923) 113-124), is of opinion that *Eriochloa ramosa* O. Kuntze has to be partly amended and changed to the new species *Eriochloa Hackelii*. Details are wanting to form an opinion on this point.

Etymology : *Eriochloa* is derived from *erion*, wool, and *chloa*, a grass, referring to the involucral glume which is silky-hairy — *Ramosa* means branched.

Description : Perennial, densely tufted, 0.6-1.5 m. high; rootstock short, creeping; stems leafy, ascending from a creeping base, stout or slender, simple or branched, glabrous except the nodes. Leaves 7.5-20 cm. by 4-5 mm., linear or linear-lanceolate, acuminate, glabrous; sheaths glabrous, ligule a villous ridge.

Panicles 5-12.5 cm. long, peduncles long or short; rachis slender, angular, smooth; branches of panicle (spikes) alternate, 2.5-5 cm. long, suberect, angular. Spikelets silvery, 3-4 mm. long, loosely imbricate, shortly pedicellate, distichous, solitary or 2-nate, elliptic-lanceolate, acuminate. Lower involucral glume 0; upper involucral glume oblong-lanceolate, acuminate, obscurely 3-nerved, silky-hairy, membranous; lower floral glume similar to the upper involucral glume; upper floral glume much shorter than the lower, elliptic-oblong, obtuse, apiculate, thinly coriaceous, pale, shining, palea oblong with incurved margins. Anthers linear. Grain oblong, free within the hardened glume and palea.

Locality : *Sind* . Umarkot, in a garden (Sabnis B718 !); Jamesabad, on banks of a water-course (Sabnis B967 !); Bughar, Indus River (Blatter & McCann D691 !), Tatta, Kullian Kote Lake (Blatter & McCann D692 !); Tatta (Blatter & McCann D693 !).

Gujarat : Ahmedabad (Gammie 16408 !).

Konkan Bassein (Bhude !), Antop Hill (McCann 3613 !), Alibag, ricefield (Ezekiel !), Bandra, on walls and in ditches (McCann !); Bombay (Hallberg A141 !), near Mahim (Woodrow, Lisboa); Bhandup, in an old distillery compound, in a ditch (Hallberg A19 !).

S. M. Country Shiggaon, 2,000 ft., rainfall 34 in. (Sedgwick 2356 !); Kunnur, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4937 !); Ranibennur (Bhude !); Dharwar (Sedgwick !).

N Kanara Haliyal (Talbot !)

Ecology : Subgregarious Found in wet places in the Carnatic.

Distribution : Tropics of the Old World, introduced into Ascension Island, St. Helena, Cuba

Economic uses: In Australia it is used as fodder

Explanation of Plate 84 : *Eriochloa ramosa* O. Kuntze.

- 1 Spikelet and part of rhachis
2. Upper invol glume
- 3 Lower floral glume
- 4 Upper floral glume.
- 5 Palea of upper floral glume.
- 6 Stamens, ovary, styles and lodicules.

47 BRACHIARIA GRiseb

(Sect *Brachnaria* and part of sect *Paspaloideae* of *Panicum* of the Fl. Brit. Ind.).

Perennial or annual Leaf-blades linear to lanceolate, usually flat, ligules reduced to a narrow ciliate or ciliate rim

Racemes usually subsessile and solitary on a common axis, sometimes bare at the base owing to the arrest of spikelets, rarely truly peduncled and panicle, simple or compound near the base, rarely to or beyond the middle, rhachis filiform, triquetrous or more or less flattened and herbaceous with a wavy or zig-zag midrib which projects as a mostly acute keel on the face, pedicels solitary or in pairs, alternately to the right and the left of the facial angle or the midrib, if solitary all short or very short, if paired, the primary slightly to very much longer; spikelets closely appressed, always biseriate in the plane, but frequently becoming 1-seriate by the dovetailing of the alternate spikelets of the closely approximate ranks, more or less contiguous with their sides or imbricate, forming dense, spike-like racemes, or distant by almost their own length or more, glabrous or hairy Spikelets more or less elliptic or oblong, more or less flattened or slightly depressed, convex on the base, falling entire from the pedicels, 1-2-, rarely more-nate, secund and adaxial (with lower involueral glume towards the axis and the convex side of the upper floral glume away from the axis), closely appressed to and 2-seriate on the triquetrous or flat rhachis of spiciform racemes; lower floret male or barren with a usually well developed palea, very rarely the latter suppressed. Involueral glumes dissimilar and mostly very unequal in length Lower involueral glume shortest; upper resembling and more or less equalling the lower floral glume, 5-7- (rarely 9-) nerved Lower floral glume 5-, rarely 7-nerved, the lateral nerves placed towards the margins and distant from the middle nerve, palea usually only slightly shorter than the valve with well-developed inflexed flaps, or the latter vanishing above the middle; upper floral glume oblong to elliptic in outline, emucronate, though sometimes contracted into an apiculus, crustaceous or subcoriaceous with firm involute margins, faintly 5-nerved, palea almost as long as the glume, 2-keeled, its sides tightly embraced by the valve. Lodicules 2, small, broadly cuneate. Stamens 3. Styles distinct; stigmas plumose, laterally exerted from the upper part of the spikelet. Grain tightly enclosed by the glume and palea, more or less flattened on both faces, hilum subbasal, punctiform; embryo half to over $\frac{2}{3}$ the length of the grain

Species about 80. In the warm parts of the whole world, but chiefly in Africa

Cooke mentions 3 species which belong to this genus *Panicum Isachne*, *P. ramosum*, and *P. muticum*. To these we add *Brachnaria distachya* (*Panicum distachyum*).

A. Spikelets 0.5 mm. long or slightly more 1. *B. Isachne*.

B. Spikelets 2.5-4 mm long

I. 90 cm. to 1.8 m. high 2. *B. mutica*.

II. Less than 90 cm. high.

1. Spikes 5-many 3. *B. ramosa*.

2. Spikes 2-4 4. *B. distachya*.



ERIOCHLOA RAMOSA O. KUNTZE

Desen: R. K. Bhadr.



BRACHIARIA ISACHNE STAPF.

1 BRACHIARIA ISACHNE Stapf.

PLATE 85.

Bracharia Isachne Stapf in Fl Trop Afr IX (1919) 552, Haines Bot Bih and Or (1924) 1004 (*habet Roth per errorem*)

B. cruciformis Griseb in Ledeb Fl. Ross IV, 469

Panicum Isachne Roth ex Roem & Schult Syst II, 458, Roth Nov. Pl Sp (1821) 54; Schult. Mant. II, 252, Steud Syn. Pl Glum I (1855) 57, Hook f. Fl Brit. Ind. VII (1896) 28; Stapf in Dyer Fl Cap. VII, 390, Cooke Fl Bomb II (1908) 931

P. cruciforme Sibth & Sm Fl. Graeca I, t 59; Baker Fl Mauritt (1877) 434, Schweinf in Bull. Herb. Boiss II, App II, 19, Duthie Grasses N. W Ind (1883) 3, Indig Fodder Grasses (1886) t 43, Fodder Grasses N Ind (1888) 6, Boiss. Fl Or. V (1884) 437.

P. caucasicum Trin Sp. Gram. Ic t. 262

P. Wightii Nees Fl. Afr Austr. (1841) 29

P. pubinode Hochst ex A Rich Tent Fl Abyss. II (1851) 363.

Echinochloa cruciformis Koch in Linnaea XXI, 437, Reichb Ic Fl. Germ I, t. 29, fig. 1413.

Vernacular names : Shimpi, Wag-hakt.

Description: Annual; stems many, 30-60 cm. long, ascending from a decumbent or creeping and rooting base, geniculate, very slender, with villous nodes, otherwise glabrous, much branched below, simple above. Leaves 2.5-5 cm. by 2-5 mm. linear-lanceolate from a rounded base, acute, subpubescent, glabrous or sparsely hairy with scaberulous margins, sheaths glabrous or hairy, ciliate on the upper part, ligule a fringe of hairs.

Inflorescence 5-7.5 cm long, erect, consisting of 6-12 secund or subsecund racemously arranged spikes 1.3-2.5 cm long, longer than the internodes, sessile or shortly pedunculate, usually appressed to the triquetrous slender hairy rachis. Spikelets 2-2.5 mm. long, secund, closely imbricate in 2 series, oblong, subacute or obtuse, softly hairy, rachis of spikes triquetrous, hairy, about 0.5 mm diam, pedicels very short. Glumes 4, lower involucral glume minute, triangular, membranous, glabrous, upper involucral glume membranous, oblong, obtuse, 5-nerved, hispidly pubescent, lower floral glume narrower, 3-nerved, paleate, neuter or sometimes male, with hyaline palea, upper floral glume shorter, oblong, obtuse, dorsally flattened, coriaceous, glabrous, shining, 2-sexual, with coriaceous palea. Anthers 1 mm. long.

Locality : Sind (Herb Econ Bot. Poona !)

Gujarat Surat (Chibber !, Dalzell teste Cooke).

Khandesh - Sungiri (Gammie 16552 !); Dhulia Farm (Chibber !); Chanseli (McCann A92 !), Nimb, Tapti Bank (Blatter & Hallberg 9571 !); Dadgaum (McCann 9562 !); Tapti, Bhusawal (Blatter & Hallberg 5156 !), Umalla village (Blatter & Hallberg 5159 !); Bor, Bor River (Blatter & Hallberg 4424 !).

Konkan Clerk Rd, Bombay, along brackish water (Sabnis 9565 !); very common in Bombay and Salsette Islands (McCann !).

W. Ghats Khandala, common (McCann 9566 !); Panchgani, below Sydney Point (Blatter & Hallberg 1271 !).

Deccan Yeola (Herb. Econ Bot. Poona !); Mangiri, 8 miles east of Poona (Gammie !); Sholapur (D'Almeida A91 !), Deolali (Blatter 9569 ! 9570 !); Purandhar, north foot (McCann 9568 !).

S. M. Country, Nelogi, 1,800 ft., rainfall 30 in (Sedgwick 2134 !); Haveri (Talbot 2150 !).

N. Kanara : Halyal (Talbot 2150 !).

Ecology: A subgregarious species. Cooke says that it grows "in watery places". This is a mistake. It is more a dry land grass and is superabundant on the Carnatic black soil. It also occurs in wetter ground, but not so typically there.

Distribution: Throughout the plains of India in damp places, Ceylon, westwards to Italy and tropical and S. Africa.

Economic uses : Considered to be a good fodder

Explanation of Plate 85 : *Bracharia Isachne* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume
5. Palea of lower floral glume.
6. Upper invol. glume.
7. Palea of upper floral glume.
8. Ovary and styles

*2 *BRACHIARIA MUTICA* Stapf.

Brachiaria mutica Stapf in Fl. Trop. Afr. IX (1919) 526

Panicum muticum Forsk. Fl. Aegypt.-Arab. (1775) 20, Lank Hort. Berol. I, 206; Hook. f.

Fl. Brit. Ind. VII (1896) 34, and in Trin. Fl. Ceyl. V, 140.

P. numidianum Lam. Ill. I, 172; Boiss. Fl. Or. V (1884) 438.

P. purpurascens Raddi ex Opiz in Flora (1822) 266.

P. barbinode Trin. Sp. Gram. Ic. t. 318, Duthie Last Grasses N. W. Ind. (1883) 2.

P. sarmentosum Benth. in Hook. Niger Fl. (1841) 561 (non Roxb.).

P. equinum Steud. Syn. Pl. Glum. I (1855) 73

P. molle Griseb. Fl. Brit. West Ind. (1864) 547 (excl. syn.); Baker Fl. Maurit. (1877) 436.

In adopting Forskal's name '*muticum*' for this species Stapf, according to his own words, has relied on Ascherson's identification (Asch. & Schweinf. Ill. Fl. Egypt, 160) of the type with the Algerian *P. numidianum*.

Vernacular names: Water Grass, Mauritius Grass, Para Grass, Scotch Grass, Buffalo Grass.

Etymology: *Mutica* means blunt, awnless

Description: Perennial 1-2.5 m. high. Stems ascending from a sometimes prostrate and copiously rooting base, stout, terete, usually many-noded and sheathed high up, simple or sparingly branched, glabrous, often waxy pruinose below the nodes. Leaf-blades linear, up to 30 cm. long, 6-16 mm. broad, glabrous or rarely more or less hirsute, margins scabrid.

Panicle oblong to ovate-oblong in outline, subsecund or almost quasquaversal, 6-20 cm. long, common rhachis terete to semiterete, more or less deeply channelled or triquetrous upwards, scabrid along the angles, glabrous. Racemes numerous, solitary or irregularly approximate, sometimes paired or in false whorls, shortly peduncled or subsessile, obliquely spreading, 7 (rarely 12) to 2.5 cm. long, mostly compound, glabrous, greenish or tinged with purple, rhachis flat, with a slender, raised midrib up to 1 mm. wide, villosulous at the base, otherwise glabrous; secondary racemes usually very short and 6-3-spiculate, pedicels solitary or paired, very short, or if paired then the longer up to 1 mm. long, frequently with a few setules. Spikelets laterally contiguous or discontinuous, those of the secondary racemes often imbricate, oblong or lanceolate-oblong, acute, 3-3.5 mm. long, glabrous. Involucral glumes dissimilar, lower broad-ovate, acute to subacute, from less than $\frac{1}{2}$ to not quite $\frac{1}{2}$ the length of the spikelet, faintly 3-5-nerved, often tinged with purple, upper corresponding in outline and size to the spikelet, 5-7-nerved. Lower floral glume as long as the upper involucral glume and similar to it, palea narrowly oblong, subacute, almost as long as the glume, with narrow flaps, anthers 2 mm. long; upper floral glume slightly shorter than the spikelet, mostly 3 mm. long, oblong, subacute or minutely apiculate, pale yellowish, glume and palea crustaceous, very finely transversely wrinkled or almost smooth. Stigmas blackish purple, very conspicuous.

Locality: Cultivated at Kirkee and Surat (Woodrow) and very likely in other places.

Distribution: A native of S. America and W. Africa, but introduced elsewhere (Stapf).

Economic uses: A fodder grass. See Kew Bull. (1894) 384.

3. *BRACHIARIA RAMOSA* Stapf.

PLATE 86.

Bracharia ramosa Stapf in Fl. Trop. Afr. IX, 542; Haines Bot. Bih. and Or. (1924) 1005.

Panicum ramosum Linn. Mant. (1767) 29; Steud. Syn. Pl. Glum. I (1855) 97; Hook. f. Fl.

Brit. Ind. VII (1896) 36 (partim); Trin. Fl. Ceyl. V, 140, Prain Beng. Pl. 1175; Cooke

Fl. Bomb. II (1908) 932.

P. arvense Kunth Rev. Gram. I (1829) 391, t. 109.

P. Petivers Diss. II, 144 (partim); Baker Fl. Maurit. (1877) 434; Aitchis. Cat. Panjab Pl. (1869) 160; Duthie Grasses N. W. Ind. (1883) 6, Fodder Grasses N. Ind. (1888) 11; Boiss. Fl. Or. V (1884) 439.

P. brachylachnum Steud. l. c. 62

P. cognatissimum Steud. l. c. 69.

P. patens Boj. Hort. Maurit. (1837) 365 (non Linn.)

P. pygmaeum Boj. l. c.

P. Helopus Watt Dict. Econ. Prod. VI, part 1, 10 (partim).

P. vibrosus Retz. Obs. IV (1786) 16, Roxb. Fl. Ind. I (1832) 297.

Vernacular names: Chapar, Chapsura.

Etymology: *Ramosa* means much branching.

Description: Annual, stem 30-90 cm. long, erect or ascending from a shortly creeping base, slender or rather stout, much branched from the base upwards, usually glabrous, leafy; nodes pubescent. Leaves 5-12.5 cm. by 4-13 mm., linear-lanceolate, finely acuminate, thin,



BRACHIARIA RAMOSA STAPF

Desm. - B. K. Bids.

flat, smooth, glabrous or pubescent beneath, with scaberulous margins, base rounded; sheaths glabrous or pubescent, ciliate or not towards the mouth, ligule a fringe of short hairs.

Panicle 5-15 cm. long, subpyramidal, with a long peduncle; rhachis angular, branches of panicle 5-10, distant, 2.5-5 cm. long, alternate or the lower opposite, erect or spreading, shorter upwards; rhachis of racemes slender, angular, puberulous. Spikelets alternate, 2.5-3 mm. long, close or distant, often in pairs (a sessile and a pedicellate one), ovoid, acute, pubescent, turgid, pale green or yellowish, pedicels with a few long hairs near the tip. Glumes 4, lower involucreal glume half as long as the lower floral glume, ovate, acute, hyaline; upper involucreal glume about equalling the lower floral glume, ovate, acute, cuspidate, 5-nerved, lower floral glume similar but slightly broader, with membranous palea, empty; upper floral glume coriaceous, ovoid-oblong, acute, rugulose, with coriaceous palea.

Stapf points out that this species occurs in a glabrous and a pubescent state, and that the original specimen in Linnaeus' herbarium represents the former "The pubescence," he says, "if present, extends generally to the culms, the leaves, the axes of the inflorescence and the spikelets, the upper glume [upper involucreal glume] and lower valve [lower floral glume]. On the blades it may be scanty and disappear with age. It does not seem to be correlated with any other character, and the area of the glabrous and pubescent states overlap completely, in fact both have been taken in the same collecting."

He mentions another curious modification in which the lower floral glume is more firmly membranous to crustaceous and faintly transversely rugose and thus more or less resembles the upper floral glume (not the upper involucreal glume as is normally the case). It has been collected in India and W. Africa.

Locality *Sind* Chachra (Mamlatdar of Chachra¹), Shahabander, (Karachi P. O. C. of Shahabander¹), Sangarh (Sabnis B901 ! B887¹), Nasarpur, clayey soil (Sabnis B1057¹).

Cutch : Sumrasar (Blatter 3756¹).

Gujarat Ahmedabad (Herb. St. X. C. 2165¹), Mausari (Mamlatdar of Mausari¹).

Khandesh : Taner, Tapi bank (Blatter & Hallberg 5172¹), Antroli, Bori River (Blatter & Hallberg 5149¹), Toranmal (McCann A142¹).

Konkan : Malabar Hill (McCann¹); Versova (McCann 9588¹); Byculla (McCann 9586¹); Sion (McCann 8689¹); Bandra Hill, in fallow fields (Vakil A115¹).

W. Ghats : Khandala (Sedgwick 2631¹).

Deccan : Poona (Woodrow¹); Lina Hill, Nasik Dist (Blatter & Hallberg A145¹).

S. M. Country Dharwar, garden weed (Sedgwick 2651¹); Haveri (Talbot 2231¹); Badami (Woodrow teste Cooke).

Ecology : A subgregarious grass.

Distribution : Throughout India, Ceylon, Afghanistan, tropical Africa (Upper Guinea, Cape Verde Islands).

Economic uses : It is a good fodder.

Explanation of Plate 86 : *Brachiaria ramosa* Stapf.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume and palea.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelet.
8. Ligule.

4. BRACHIARIA DISTACHYA Haines.

Brachiaria distachya Haines Bot. Bih. and Or. (1924) 1004 (*per errorem distachyum*).

Panicum distachyum Linn. Mant. I (1767) 138; Retz. Obs. III (1783) 17; Lamk. III, t. 43, fig. 2; Steud. Syn. Gram. (1855) 41; Aitchis. Cat. Panjab Pl. (1869) 159; Duthie Grasses N. W. Ind. (1883) 3, Indig. Fodder Grasses (1886) t. 42, Fodder Grasses N. Ind. (1888) 6; Benth. Fl. Austral. VII (1878) 478; Hook. f. Fl. Brit. Ind. VII (1896) 37.

P. subquadruparum Trin. Gram. Panic. 145, Sp. Gram. Ic. t. 186.

Digitaria distachya Pers. Syn. I (1805) 85.

Vernacular name : Motia.

Etymology : *Distachya* means having 2 spikes.

Description : A slender, creeping grass, glabrous or panicle sparsely hairy. Stems 30-60 cm. high. Leaves linear or lanceolate or linear-lanceolate, acuminate, 5-15 cm. by 3-6 mm., widest at the rounded or amplexicaul base, flat, sheaths ciliate or not on the margins, mouth hairy.

Spikes 2-4, distant, 2.5-6.5 cm. long, rarely more than 10 cm., erect, at last spreading; rhachis slender, glabrous. Spikelets variable in size, pale green, 3-4 mm. long, solitary, subsessile, spikately arranged in 2 (-1) series, ellipsoid, glabrous. Lower involucreal glume embracing the spikelet and margins overlapping below, $\frac{1}{2}$ to nearly $\frac{1}{2}$ the spikelet, 5-7-nerved, obtuse or subacute, upper involucreal glume ovate, acute, 7-nerved, paleate or not, palea if present narrow, neuter. Lower floral glume 5-nerved, upper ellipsoid, obtuse or rounded, 2 mm. long, brown and minutely transversely lineolate or obscurely rugulose when ripe.

Locality: *Gujarat* - Ahmedabad, banks and margins of fields around Ahmedabad (Sedgwick 239 ¹).

S. M. Country. Dharwar (Sedgwick 2840 ¹).

Ecology: A subgregarious species.

Distribution: India, Ceylon, China, Malaya, Australia.

Economic uses: Cultivated for fodder in Australia, produces great quantities.

48. *PASPALUM* Linn.

Mostly perennial grasses of varying habit

Spikelets orbicular to oblong, mostly decidedly plano-convex, falling entire from the short rudimentary pedicels, solitary or paired, secund and abaxial on the dilated or narrow rhachis of spike-like racemes, lower floret barren, reduced to its floral glume; upper floret hermaphrodite. Involucreal glumes, the lower typically suppressed, very rarely represented by a small scale, the upper more or less equal to the spikelet, rarely shorter or absent, convex, membranous, 3- or more-nerved. Lower floret. floral glume very similar to the upper involucreal glume, but usually flat or at least less convex, rarely subconcave, the middle nerve sometimes suppressed. Upper floret. floral glume chartaceous to crustaceous with firm margins, obtuse, emucronate, faintly nerved, palea subequal to the floral glume and similar in substance, tightly embraced by the narrowly involute margins of the floral glume. Lodicules 2, minute, broadly cuneate. Stamens 3. Styles distinct, stigmas laterally exerted near the tip of the floret. Grain tightly enclosed by the slightly hardened floral glume and palea, more or less biconvex; scutellum orbicular-elliptic, shorter than half the grain, hilum subbasal, punctiform.

Species over 200—Chiefly in tropical America, only a few in the Old World.

Cooke describes 3 species: *P. scrobiculatum* Linn., *P. compactum* Roth and *P. distichum* Linn., to which we add *Paspalum dilatatum* Poir. *P. distichum* has to be replaced by *P. vaginatum* Sw., for reasons detailed below.

I. Leaves over 14 cm. long.

- | | | |
|-------------------------|-----------|------------------------------|
| 1. Plant 60-90 cm. high | | 1. <i>P. scrobiculatum</i> . |
| 2. Plant 1-1.5 m. high | | 2. <i>P. dilatatum</i> . |

II. Leaves less than 11 cm. long.

- | | | |
|--|-----------|--------------------------|
| 1. Leaves 2.5-7.5 cm. long, 8-12 mm. broad | | 3. <i>P. compactum</i> . |
| 2. Leaves 5-10 cm. long, 1.2-4 mm. broad | | 4. <i>P. vaginatum</i> . |

1. *PASPALUM SCROBICULATUM* Linn.

PLATE 87.

Paspalum scrobiculatum Linn Mant (1767) 29, Roxb. Fl. Ind. I (1832) 278; Grah. Cat. Bomb. Pl. (1839) 234, Dalz. & Gbs. Bomb. Fl. Suppl. (1861) 97, Duthie Field and Gard. Crops 8, t. 27, Grasses N. W. Ind. (1883), Indig. Fodder Grasses (1886), t. 1, Fodder Grasses N. Ind. (1888), Hook f. Fl. Brit. Ind. VII (1896) 10 (excl. syn. *P. orbiculare* Forst.), Cooke Fl. Bomb. II (1908) 943, Flammes Bot. Bih. and Or. (1924) 1000.

P. scrobiculatum var. *Commersoni* Stapf in Fl. Trop. Afr. IX (1919) 573.

P. scrobiculatum var. *frumentaceum* Stapf l. c. 575.

P. scrobiculatum var. *polystachyum* Stapf l. c. 576.

P. alternans Steud. Syn. Pl. Glum. (1855) 26.

P. auriculatum et *confragosum* Presl Rel. Haenk. I (1830) 216, 217.

P. borbomcum Steud. l. c. 27.

P. Commersoni Lam. Illustr. I, 175.

P. coromandelianum Lam. l. c.

P. dissectum Linn. Syst. II, 86.

P. demissatum Linn. Syst. ed. X, 855.

P. firmum Trin. Gram. Fanc. (1826) 105; Sp. Gram. Ic., t. 125.

P. flexuosum Klein ex Presl l. c. 215.

P. frumentaceum Rottb. ex Roem. & Schult. Syst. II (1817) 296.

- P. hirsutum* Retz. Obs. II (1781) 7
P. Houttuynii H. C. Hall ex de Vries in Pl. Ind. Bat. Reinw. 113.
P. Kora Willd. Sp. Pl. I, 332, Roxb. Fl. Ind. I (1832) 279, Grah. L. c., Duthie Indig. Fedder Grasses (1886) t. 2
P. longifolium Roxb. Fl. Ind. I (1832) 280
P. mauritanicum Nees ex Steud. l. c.
P. metabolon, Metzn. et Mollipilum Steud. l. c. 19, 21, 29.
P. polystachyum et pubescens R. Br. Prodr. (1810) 188.
P. puberulum Roem. & Schult. Syst. II, 316 (*Paspalus*)
P. sumatrense Roth. Nov. Sp. (1821) 35.
P. Thunbergii Kunth ex Steud. l. c. 28
P. venustum Forst. f. ex Roem. & Schult. l. c. 297
P. Zollingeri Steud. l. c.
P. dissectum Nees Fl. Afr. Austr. (1841) 15 (non Linn.).
P. Jardini Steud. l. c. 18.
Panicum dissectum Linn. Sp. Pl. (1753) 57
 Rheede Hort. Mal. XII, t. 84

As can be seen from the above synonymy we are not following Stapf in distinguishing several varieties or rather forms. He takes the cultivated forms of India to be the original *P. scrobiculatum* of Linnaeus and calls it *P. scrobiculatum* var. *frumentaceum*. All the spontaneous forms of *P. scrobiculatum* as understood by most post-Linnaean authors are put by Stapf under *P. scrobiculatum* Linn. var. *Commersonii*, the type for this combination being *P. Commersonii* Lam. III I, 175, t. 43, fig. 1. The third form var. *polystachyum* does not seem to occur in India.

Vernacular names : Kodra, Pakodi, Harnick, Dhone, Majore, Mana kodra.

Etymology : *Paspalum* from the Greek term for a millet—*Scrobiculatum* means 'being marked by minute or shallow depressions'.

Description : Annual, stems 60-90 cm. long, tufted on a very short rhizome, erect (rarely ascending), leafy from the base upwards, glabrous. Leaves bifarious, erect or suberect, 15-45 cm. by 2-3 mm., finely acuminate, glabrous or sometimes softly hairy; sheaths 10-20 cm. long, compressed, loose, the mouth hairy, with very short membranous ligules.

Spikes 2-6, sessile, usually distant and spreading, 2.5-15 cm. long, rachis herbaceous, 2-3 mm. broad with ciliate margins. Spikelets usually 2-ranked, 2-3 mm. diam., sessile or shortly pedicellate, broadly elliptic or suborbicular, umbonate. Glumes 3, lower involucral glume 0, the upper convex, 3-7-nerved, membranous; lower floral glume flat, membranous, like the upper involucral glume, upper floral glume thickly coriaceous, brownish, shining, striolate, palea orbicular, tumid, thickly coriaceous like the upper floral glume, dorsally convex, ventrally strongly inflexed below the middle and forming 2 broad membranous auricles that embrace the grain.

We have found the inflorescence composed of even one spike, two spikes are fairly common.

Locality : Sind. Jamesabad, in bed of watercourse (Sabnis B979 !), Bohara (Blatter & McCann D689 !).

Konkan. Bombay, Victoria Gardens (McCann 4297 !), Mulgaum, Salsette (McCann 3607 !), Parsik, between stones of railway tract (McCann 9516 !), Vihar Lake, Salsette (McCann 9517 !).

W. Ghats. Khandala, in watercourse, on sandy soil (McCann 9824 !), Castle Rock (Gammie !).

S. M. Country. Konankeri, Dharwar Dist., 1,800 ft., rainfall 40 in. (Sedgwick & Bell 4966 !); W. of Dharwar, 2,000 ft., rainfall 40 in. (Sedgwick & Bell 4452 !); Dastikop, 2,500 ft., rainfall 35 in. (Sedgwick 2109 !); Dharwar (Garade !), Belgaum (Herb. Bot. Gard. Calc. !).

N. Kanara. Halyal (Talbot 2297 !), Karwar (Herb. Econ. Bot. Poona 2297 ! 618 !).

Ecology : Well adapted for the poorest soils under favourable conditions of climate and rainfall. Specimens growing on rocky or hard soil have woolly bases.

Distribution : Tropics of the Old World.

Economic uses : In 1922-23 245,911 acres were under cultivation in the Presidency. The grain is used as food by a very large number of people, chiefly of inferior caste. "The grain as well as the straw of Kodra frequently, if not always, contains a poisonous narcotic principle which causes vomiting and vertigo. For this reason care is taken at least in the Konkan to prevent cattle straying into Kodra fields. The poisonous principle is probably produced under unfavourable conditions of climate and season and the grain and straw are only poisonous in particular seasons. It is said that. the narcotic property is to some extent neutralised by

steeping in cowdung and water, or by keeping the grain for a number of years. Though the poisonous and non-poisonous grain cannot usually be distinguished by ordinary people, yet cultivators in Gujarat claim that the diseased grain can be detected while threshing as then the effect of the poisonous dust is felt both by the threshing bullocks and their driver" (Mann).

According to Dr Lisboa the symptoms of poisoning resemble those caused by *Datura*, and are severer in cattle than in man, due no doubt to their eating the grain and husk and also to the absence of vomiting.

Explanation of Plate 87 : *Paspalum scrobiculatum* Linn.

1. Rhachis with one spikelet.
2. Upper invol. glume.
3. Lower floral glume
4. Upper floral glume
5. Palea of upper floral glume.
6. Grain.

*2. *PASPALUM DILATATUM*¹ Poir

Paspalum dilatatum Poir. Encycl. V, 35, New South Wales Agric. Gaz. X (1899) 32, with plate ; Trin. Diss. 11, 113, with plates, H. H. Mann in Dept. Agric. Bomb. Bull. 77, 68

P. ovatum Nees ex Trin. Gram. Panic. 113

P. pratense Spreng. Syst. Veg. I (1825) 247.

P. Sellow Spreng. ex Nees Agrost. Bras. 43.

Vernacular names : Golden Crown Grass, Hairy-flowered Paspalum, Large water-grass, Leichardt Grass

Description : A tall, erect grass, about 1-1.5 m. high. Culm developing from a thick rootstock with 3-5 leaves ; leaf at base of culm often about 30 cm. long, 8-12 mm. broad, smooth on both sides, rugose along the margins.

Raceme 12-30 cm. long, having 5-10 somewhat spreading spikes, which are 7 cm. or more in length, 2.5-5 cm. apart, upper ones gradually shorter. Spikelets closely arranged in 4 rows, two on each side of the narrow and nearly straight axis in alternate pairs, 1.5-2 mm. wide, and 3-4 mm. long, ovate, acutely pointed, crowded and overlapping each other, compressed, margins clothed in silky hairs. Involucral glumes ovate, acute, 5-nerved, nearly smooth except the fringe of white hairs on the margin. Floral glumes thick, hard, and firm, very minutely punctate. Palea fitting inside the flowering glume and enclosing the stamens and styles. Anthers linear. Styles 2, stamens blackish-purple, plumose.

Locality : Cultivated. See Mann, l. c

Ecology : In other countries this grass thrives best upon rich moist land, and grows very luxuriantly in black alluvial soils. It is said to succeed also in sandy soils, even when a considerable proportion of salt is present. As it is a deep-rooted grass it has a remarkable capacity for withstanding conditions of drought. In Western Australia it is said to flourish in poor mountain soils.

Distribution : Virginia, Mississippi, Louisiana, Texas, S. America, especially Brazil. Introduced in many countries

Economic uses : Opinions seem to differ on the value of this species as a forage grass. Hitchcock says that it has been tried as a forage grass in the Southern States of N. America, but that it has little to recommend it there. In the Hawaiian Islands, however, it gives much promise as a pasture grass. For dairy purposes it is of great value as it has great milk-producing properties. For hay, this grass is rather coarse, and usually has a bad colour when dry, but it is of excellent quality, and the yield is very large. See Kew Bull. (1902) 1-4

3 *PASPALUM COMPACTUM* Roth.

PLATE 88.

Paspalum compactum Roth Nov. Pl. Sp. (1821) 36, Kunth Enum. Pl. I (1838) 61 ; Steud. Syn.

Pl. Glum. (1855) 31, Hook. f. Fl. Brit. Ind. VII (1896) 12 ; Cooke Fl. Bomb. II (1908) 943.

P. miharia C. Muell. in Bot. Zeit. XIX (1861) 325.

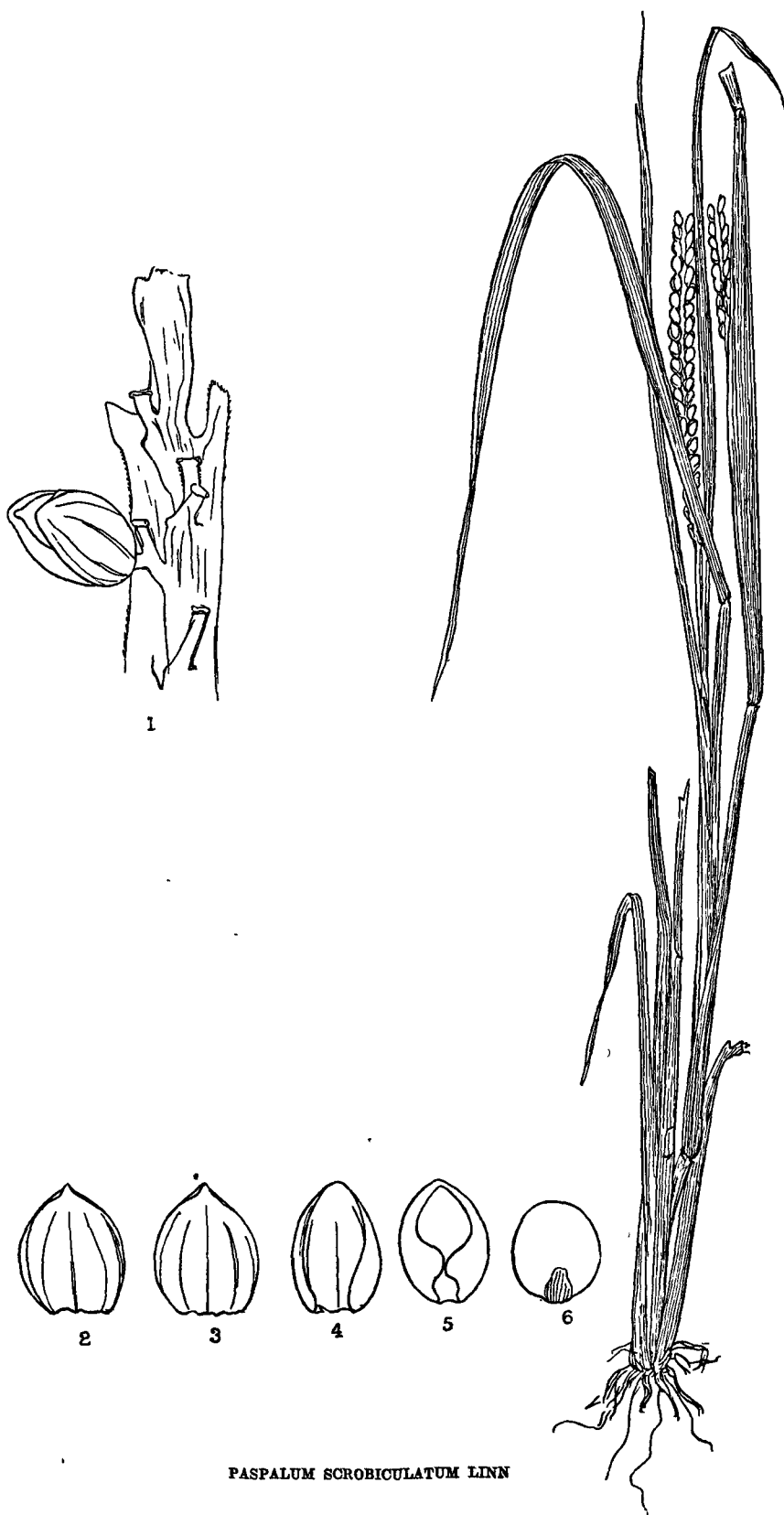
P. Canaræ Steud. l. c. 58.

P. imperfectum Roxb. ex Kunth l. c.

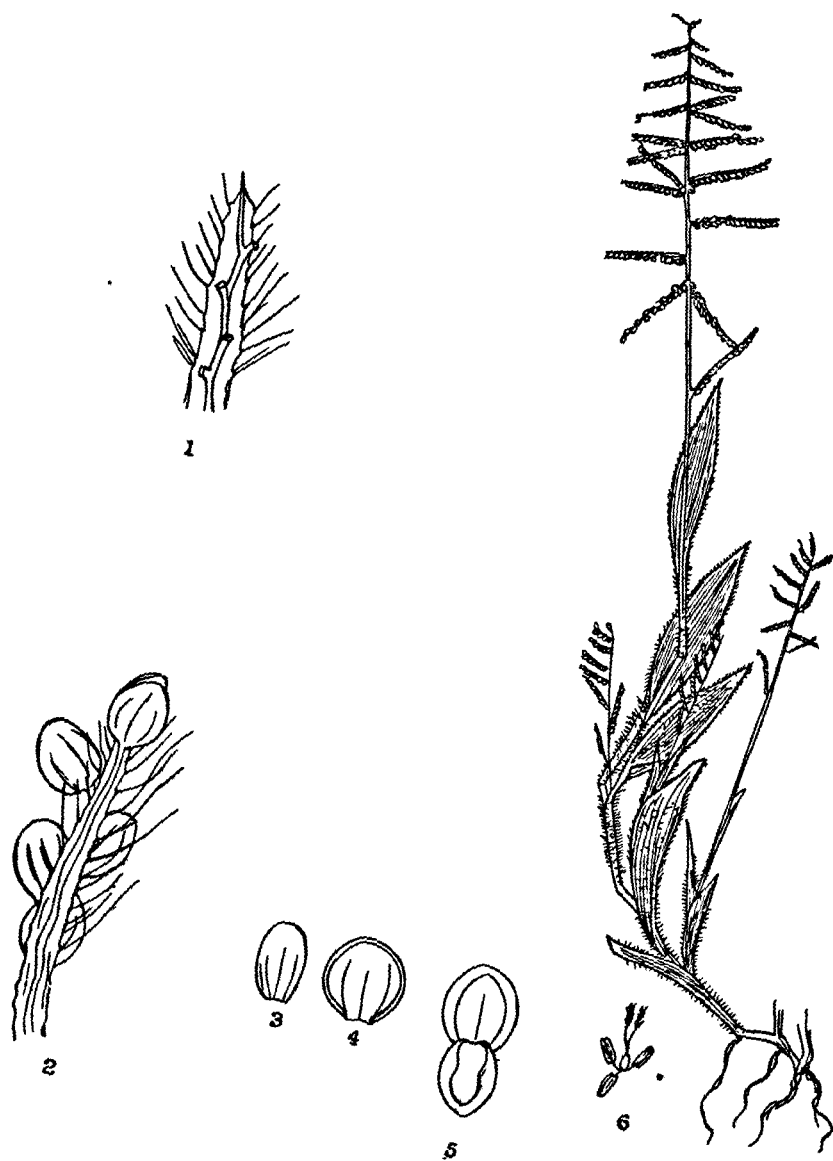
Etymology : *Compactum*, which means compact, seems to allude to the rather turgid spikelets.

Description : Plant 15-30 cm. high, roots stiff, wiry, stems terete, decumbent and branched below, leafy, hairy. Leaves 2.5-7.5 cm. by 8-13 mm., elliptic-lanceolate, acute,

¹ We have to thank Mr. K. Burwas, the Curator of the Herbarium of the Sibiur Botanic Garden, for most of the information contained under this species.



PASPALUM SCROBICULATUM LINN



PASPALUM COMPACTUM ROTH.

sparsely hairy on both sides, ciliate, sheaths densely hairy with fine bulbous-based hairs; ligule very short.

Spikes numerous, shorter upwards, spreading (often nearly horizontally), glabrous or nearly so, forming a pyramidal raceme 5-10 cm. long, rhachis slender, triquetrous. Spikelets 1.2-1.6 mm diam., hemispheric, rather turgid, close-set but not imbricate, pendulous by short filiform pedicels. Lower involucre glume 0, upper involucre glume broadly elliptic or sub-orbicular; lower floral glume narrower; upper floral glume subcoriaceous, concave, orbicular, rounded at the tip, white, palea not or obscurely auricled.

Locality: *Konkan* Tiwari-Pada, Bassein (Herb Econ. Bot Poona 1690 ')

W Ghats Matheran, to Louisa Point (D'Almeida A243 '), Igatpur, very common (McCann 4587 '), Khandala growing in gravelly soil, very common (McCann 9823 '); Panchgani, First Tableland (McCann B1265! B1300 '), Second Tableland (McCann B1242! B1292 '); Mahabaleshwar (Cooke, Woodrow), Londa (Bhide '), Castle Rock, 1,900 ft, rainfall 250 in. (Sedgwick 2752 ')

S M Country Belgaum (Hole 15 ').

N. Kanara: Yellapur (Talbot 657 '), Tinai (Talbot 2566 '), Karwar, Bingy Ghat (a very villous form, McCann) (Talbot 1529 '), Devmane, 1,300 ft. (McCann A17 ').

Ecology: This plant is commonly found on gravelly soil and in the hollows of rocks where a little earth has collected. Specimens on rocks form large matted masses and those in gravelly soil grow erect among other plants. Plants from N Kanara are exceptionally villous.

Distribution: W Peninsula of India.

Explanation of Plate 88: *Paspalum compactum* Roth.

1. Rhachis.
2. Spikelets on rhachis.
3. Upper invol. glume
4. Lower floral glume.
5. Upper floral glume with palea.
6. Stamens, ovary and styles.

4. PASPALUM VAGINATUM Sw.

PLATE 89

Paspalum vaginatum Sw. Prodr. Veg. Ind. Occ. (1787) 21, Fl. Ind. Occ. I (1797) 135; Trin. Gram. Pan. 94, Panic Gen. 53, Sp. Gram. Ic. t. 120, Kunth Enum. I (1838) 52; Steud. Syn. Pl. Glum. I (1855) 20; Hitchcock & Chase in Contrib. U. S. Nat. Herb. XVIII, 307 (non P. Beauv. Fl. Owar); Stapf in Fl. Trop. Afr. IX, 570.

P. vaginatum forma longipes Lange in Vidensk. Medd. Naturh. Foren. Kjobenh. (1854) 42, Pug. Pl. Hisp. I (1860) 28

P. distichum N. L. Burm. Fl. Ind. (1768) 23, Gaertn. Fruct. II, 2, t. 80, Kunth l. c.; Steud. l. c. 29, Baker Fl. Maurt. (1877) 431; Benth. Fl. Austr. VII (1878) 460, Hack. in Forsch. chungsr. S. M. S. "Gazelle" IV, 6; Hook. f. Fl. Brit. Ind. VII (1896) 12; Rendle in Journ. Linn. Soc. Bot. XXXVI, 319; Cooke Fl. Bomb. II (1908) 943; Radley Mat. Fl. Mal. Pen. III, 124; Stapf in Dyer Fl. Cap. VII, 371; Merrill in Philipp. Journ. Sc. I, Suppl. I, 346 (non Linn.).

P. distichum var. vaginatum Griseb. Fl. Brit. W. Ind. (1864) 541.

P. littorale R. Br. Prodr. (1810) 188; Trin. Gram. Pan. 95, Sp. Gram. Ic., t. 112.

P. longiflorum P. Beauv. Fl. Owar. II, 46, t. 85, fig. 2; Grah. Cat. Bomb. (1839) 234 (non Retz.).

P. brachyatum Trin. ex Nees Agrost. Bras. 62.

P. foliosum Kunth Rev. Gram. I (1829) 25

P. squamatum Steud. l. c. 21.

P. inflatum A. Rich. in Ram. de Sagra Fl. Cub. III (1853) 298.

P. kleinsvanum Presl Rel. Haenk. I (1830) 209.

P. Boryanum Presl l. c.

Digitaria foliosa Lag. Gen. et Sp. Nov. 4.

D. vaginata Philppe Fl. d. Pyren. II (1860) 415.

D. paspaloides var. longipes Lange ex Willk. & Lange Prodr. Fl. Hisp. I, 45.

Sanguinaria vaginata Bub. Fl. Pyren. IV, 258.

To explain the change of name from *P. distichum* Linn. to *P. vaginatum* Sw., and to elucidate certain points of the above synonymy taken from Stapf, it will suffice to quote the short explanation given in the Fl. Trop. Afr., p. 572: "Frequently confused with *Paspalum aristatum* Linn. (Herb. Linn. l) which has broader and flatter leaves mostly sessile or subsessile lateral spikes and spikelets with firmer sides and a more convex upper glume, which is appressedly and silky pubescent."

Etymology : *Vaginatum* means sheathed, alluding to the ascending part of the stem being entirely covered with the leaf-sheaths.

Description : Perennial, stem many-noded, sheathed throughout, ascending from a creeping, rooting, often very long and branched base. Leaves numerous, distichous, 5-10 cm. by 1-2-4 mm., linear-lanceolate, acuminate, involute or flat, spreading, membranous, or in short-leaved states, stiff and pungent, glabrous or nearly so; sheaths thin, glabrous except the usually bearded mouth, ligules very short, truncate.

Spikes 2-nate, shortly pedunculate and articulate on the top of the stem, rachis herbaceous, 1-2 mm. broad. Spikelets subsessile, solitary or 2-nate, elliptic-oblong, 2-4 mm. long, dorsally flattened, imbricate and appressed to the rachis, glabrous, pale. Lower involucrel acute, glume 0, upper involucrel glume membranous, with a scarcely evident midnerve; lower floral glume like the upper involucrel glume with a distinct midnerve, upper floral glume shorter, elliptic, concave, acuminate, subcoriaceous, smooth, nearly white, palea not or obscurely auricled. Anthers 1-2-1-6 mm. long.

Locality : *Gujarat* Marshy edge of the Bokh, Prantij (Herb. Econ. Bot. Poona !)

Konkan Marine Lines, Bombay (Hallberg 9514 !), seashore, Bombay (Woodrow), Malabar Hill, Bombay (McCann 3609 !), St. Xavier's College compound (McCann 9830 !), Aihbag, sandy shore (Ezekiel !); Malvan (Woodrow).

Ecology : The flowers open early in the afternoon, at that time the two spikes form a V. When the anthers have shed their pollen the two spikes begin to droop until they form a close fold Λ . (Moses Ezekiel on sheet) This may be due to the action of the sun. In fruit the spikes appear to become horizontal.—Grows along muddy coasts and banks of ditches.—Very common in a salt marsh near Sion where it forms dense mats on the surface of water with part of the stems above water. Plants collected in that locality during the rains are much bigger than the usual form. The spikes vary from 2-3 and are as much as 5 cm. long, pale yellow-green, almost white. The whole plant is glaucous. The styles are deep purple, turning black.

Distribution : Tropics of the whole world, mostly on the seashore; introduced into Galicia (Spain) and the Western and Central Pyrenees.

Economic uses : Where abundant it furnishes some forage.

Explanation of Plate 89 : *Paspalum vaginatum* Sw.

1. Spikelets on rachis
2. Upper involucrel glume
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary, styles and lodicules.

49. PASPALIDIUM Stapf.

(Sect. *Paspaloideae* in Fl. Brit. Ind., *partim*.)

Perennial, semiaquatic or terrestrial. Leaves linear, flat or involute. Ligule a ciliate rim. Racemes sessile or subsessile and secund on the alternate notches of a triquetrous common axis of a false compound spike, more or less appressed to the more or less hollowed-out flanges of the latter. Rachis ending in a subulate point. Spikelets mostly conspicuously 2-seriate, nearly always quite glabrous, ovate to ovate-oblong or ovate-lanceolate (when seen in front view), awnless, falling entire from the pedicels, solitary, secund and abaxial on the rachis.

Involucrel glumes mostly dissimilar and very unequal in length, lower reduced to a small scale or up to, rarely over, half the length of the spikelet, upper mostly almost equalling the spikelet, 5-7-nerved with the nerves evenly distributed, rarely both glumes much reduced. Lower floral glume similar to the upper involucrel glume with the inner side-nerves more distant, palea if present only slightly shorter than its glume with well developed inflexed flaps; upper floral glume oblong to elliptic in outline, acute to apiculate, emarginate, crustaceous, with firm involute margins, faintly 5-nerved, palea almost as long as its glume, 2-keeled, its sides tightly embraced by the glume all along. Lodicules 2, small, broadly cuneate. Stamens 3. Styles distinct, stigmas plumose, laterally exerted from the upper part of the spikelet. Grain tightly enclosed by the more or less hardened glume and palea.

Species about 12.—In the warm countries of the whole world. 6 are confined to Australia and New Caledonia.

Cooke (II, 929) describes 3 species belonging to this genus: *Panicum flavidum* Retz., *P. punctatum* Burm. and *P. fluitans* Retz. We retain all, but substitute the older name *gemma-tum* for *fluitans*.

- I. Lower spikes shorter than the internodes. Upper involucrel glume shorter than the upper floral glume . . . 1. *P. flavidum*.



PASPALUM VAGINATUM SW.

Desm. B. K. BM.



PASPALIDIUM FLAVIDUM A. CAMUS.

Desm: R. K. Bhu

- II. Lower spikes as long as or longer than the internodes. Upper involucreal glume about $\frac{1}{2}$ the upper floral glume . . . 2. *P. punctatum*.
 III. Lower spikes as long as or shorter than the internodes
 Upper involucreal glume mostly as long as the upper floral glume 3. *P. gemmatum*.

1. *PASPALIDIUM FLAVIDUM* A. Camus.

PLATE 90.

Paspalidium flavidum A. Camus in Lecomte Fl. l'Indo-Chine VII, 419; Haines in Bot. Bh. and Or. (1924) 1001 (erronee attribuens combinationem Stapfio).

Panicum flavidum Retz. Obs. IV (1786) 15, Griff. Notul. III, 33, Ic. Pl. As. t. 138, fig. 67; Duthie Grasses N. W. Ind. (1883) 3, Indig. Fodder Grasses (1886), t. VI, Fodder Grasses N. Ind. (1888) 7, Benth. Fl. Austr. VII (1878) 474, Hook. f. Fl. Brit. Ind. VII (1896) 28; Cooke Fl. Bomb. II (1908) 929.

P. breviusculum Jacq. Eclog. Gram. (1813) 2, t. 2, Roxb. Fl. Ind. I (1832) 292; Dalz. & Gibs. Bomb. Fl. (1861) 290, Duthie Grasses N. W. Ind. (1883) 2, Aitchis. Cat. Panjab Pl. (1869) 159; Baker Fl. Maunt. (1877) 433.

P. flavidum Royle III Bot. Himal. 420.

P. granulare Lam. III, I, 170.

Etymology: *Flavidum* means yellowish.

Description: Stem 0.3-1.2 m. long, slender, ascending from a short decumbent base; nodes glabrous. Leaves subbifarious, 7.5-12.5 cm. by 4-6 mm., narrowly linear, acuminate, thinly coriaceous, glabrous or the margins slightly scaberulous, sheaths compressed, glabrous, the margins not ciliate; ligule a ridge of long hairs.

Spikes few or many, distant, erect 1.3-2.5 cm. long, shorter than the internodes, secund sessile, rhachis flattened, glabrous. Spikelets 2.5 mm. long, gibbously globose, sessile or nearly so, 2-seriate, closely imbricate, glabrous. Glumes 4, pale green or nearly white, the 3 lower with green nerves, lower involucreal glume about half as long as the spikelet, orbicular, concave, 3-nerved, upper involucreal glume broadly ovate, concave, shorter than the upper floral glume, 7-nerved, lower floral glume shorter than the upper, orbicular, 5-nerved, paleate, empty; upper floral glume broadly ovate or almost orbicular, often mucronate, very convex, striolate-punctate, white. Palea with the sides infolded nearly to the middle, striolate.

Locality: *Sind* Sanghar (Sabnis B762!).

Gujarat: Near Surat (Dalz. & Gibs. teste Cooke).

Kathnawar Morvi (Woodrow teste Cooke); Porbandar (Woodrow teste Cooke).

Konkan Mulgaum (McCann 9579!); Thana (McCann 8726!); N. & S.

Konkan (Laws teste Cooke).

W. Ghats Khandala (Woodrow teste Cooke!);

Deccan Poona (Bhide!), Mr. Gammie's compound, Kirkee (Bhide 894!).

S. M. Country: Konankern, in a small tank, 1,800 ft., rainfall 40 in. (Sedgwick & Bell 4964!); Belgaum (Herb. Econ. Bot. Poona!).

N. Kanara Yellapur (Talbot!), Halyal (Talbot 2095!).

Ecology: A sporadic grass. Very abundant in the Carnatic both as an associate of man and also far into the Kanara forests.

Apparently a shade loving species, flowering during the rains. The inflorescence is usually very long with the spikes placed at distant intervals. Spikes frequently with a few imperfect spikelets at the top. Leaves often reaching 30 cm. by 12 mm., many-nerved. Tips obtuse, acute or acuminate, margins scabrid, base rounded, sometimes almost subcordate.

Distribution: Plains of India, Ceylon, tropical Asia (not in tropical Africa as reported by Hook. f. and Cooke).

Economic uses: The grain is eaten by the poorer classes especially at times of famine. According to Church the flour of the grain is indigestible. The chief constituents are fat or oil. Affords a good fodder for cattle and horses.

Explanation of Plate 90: *Paspalidium flavidum* A. Camus.

1. Rhachis.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Palea of lower floral glume.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary and styles.

2. *PASPALIDIUM PUNCTATUM* A. Camus.

PLATE 91

Paspalum punctatum A. Camus in Lecomte Fl. l'Indo-Chine VII, 419; Haines in Bot. Bih. and Or. (1924) 1001 (*erronee attribuens combinationem Stapfia.*).

Panicum punctatum Burm. Fl. Ind. (1768) 26; Hook. f. Fl. Brit. Ind. (1896) VII, 29; Cooke Fl. Bomb. II (1908) 929.

Vernacular names : Pet-nar, Dossa.

Etymology : *Punctatum* meaning punctate, refers to the upper floral glume which is granulate.

Description : Perennial, quite glabrous; stem prostrate at the often floating base, 0.6-1.2 m. long, rooting at the lower stout spongy nodes. Leaves 10-20 cm. by 6-10 mm., linear, acute, or acuminate, base narrow, lower sheaths inflated; ligule a ridge of hairs. Spikes many, 1.3-2.5 cm. long, distant, sessile, longer than the internodes, appressed to the glabrous rhachis, very pale.

Spikelets 2.5-3 mm. long, imbricate, sessile, 2-seriate, ovoid-oblong on a flattened undulate rhachis which is produced beyond the spike into an acicular tip which is as long as or longer than the terminal spikelet. Glumes 4, lower involucre glume small, about 1.2 mm. long, orbicular, rounded or slightly retuse at the apex, thinly membranous; upper involucre glume about half as long as the floral glumes, membranous, 3-5-nerved, orbicular, with truncate or rounded tip, lower floral glume ovate, acute, 3-5-nerved, membranous, neuter; upper floral glume about as long as the lower, cuspidately acuminate, thinly coriaceous, granulate, white. Palea coriaceous, with inflexed membranous sides. Anthers 1.2 mm. long.

Locality : Deccan - Poona (Woodrow, Lisboa), Ahmednagar (Woodrow).

Ecology : A subgregarious species growing in marshes.

Distribution : Throughout India in marshes, Ceylon, Malaya (not in tropical Africa).

Explanation of Plate 91 : *Paspalum punctatum* A. Camus.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens ovary and styles.
7. Spikelets.
8. Rhachis and spikelet.

3. *PASPALIDIUM GEMINATUM* Stapf.

Paspalum geminatum Stapf in Fl. Trop. Afr. IX (1920) 583; Haines Bot. Bih. and Or. (1924) 1002.

Panicum geminatum Forsk. Fl. Aegypt-Arab. (1775) 18; Schweinf. in Bull. Herb. Boiss. II, App. II, 19; Hack in Bull. Herb. Boiss. IV, App. III, 14; Hitchcock & Chase in Contrib. U. S. Herb. XV, 30.

P. fistans Retz. Obs. III (1783) 8 et V (1789) 18; Willd. Sp. Pl. I, 338; Kunth Enum. I (1838) 78; Steud. Syn. Pl. Glum. I (1855) 59; Miq. Fl. Ind. Bat. III, 455; Baker Fl. Maurt. (1877) 433; Cooke Fl. Bomb. II (1908) 929.

P. brizoides Lam. Ill. I, 170 (*non* Retz.).

P. paspaloides Pers. Syn. I (1805) 81; Kunth Enum. I (1838) 77; Steud. l. c. 60; Boiss. Fl. Or. V (1881) 436; Balfour f. Fl. Socotra (1888) 310; Hook. f. Fl. Brit. Ind. VII (1896) 30, in Trin. Fl. Ceyl. V, 135.

P. beckmannaeforme Mikan ex Trin. in Spreng. Neue Entdeck. II, 83; Spreng. Syst. I (1825) 309.

P. truncatum Trin. Diss. II, 130, et Sp. Gram. Ic. t. 168.

P. affine Nees Agrost. Bras. 113.

P. brizaeforme Presl Rel. Haenk. (1830) 302; Steud. l. c. 60.

P. numidianum Sieb. ex Schult. Mant. II, 267 (*non* Lam.).

P. carnosum Salzm. ex Steud. l. c.

P. appressum Doell in Mart. Fl. Bras. II, II, 184.

P. glomeratum Buckl. Prel. Rep. Geol. Agr. Surv. Tex. App. 3 (*non* Moench.).

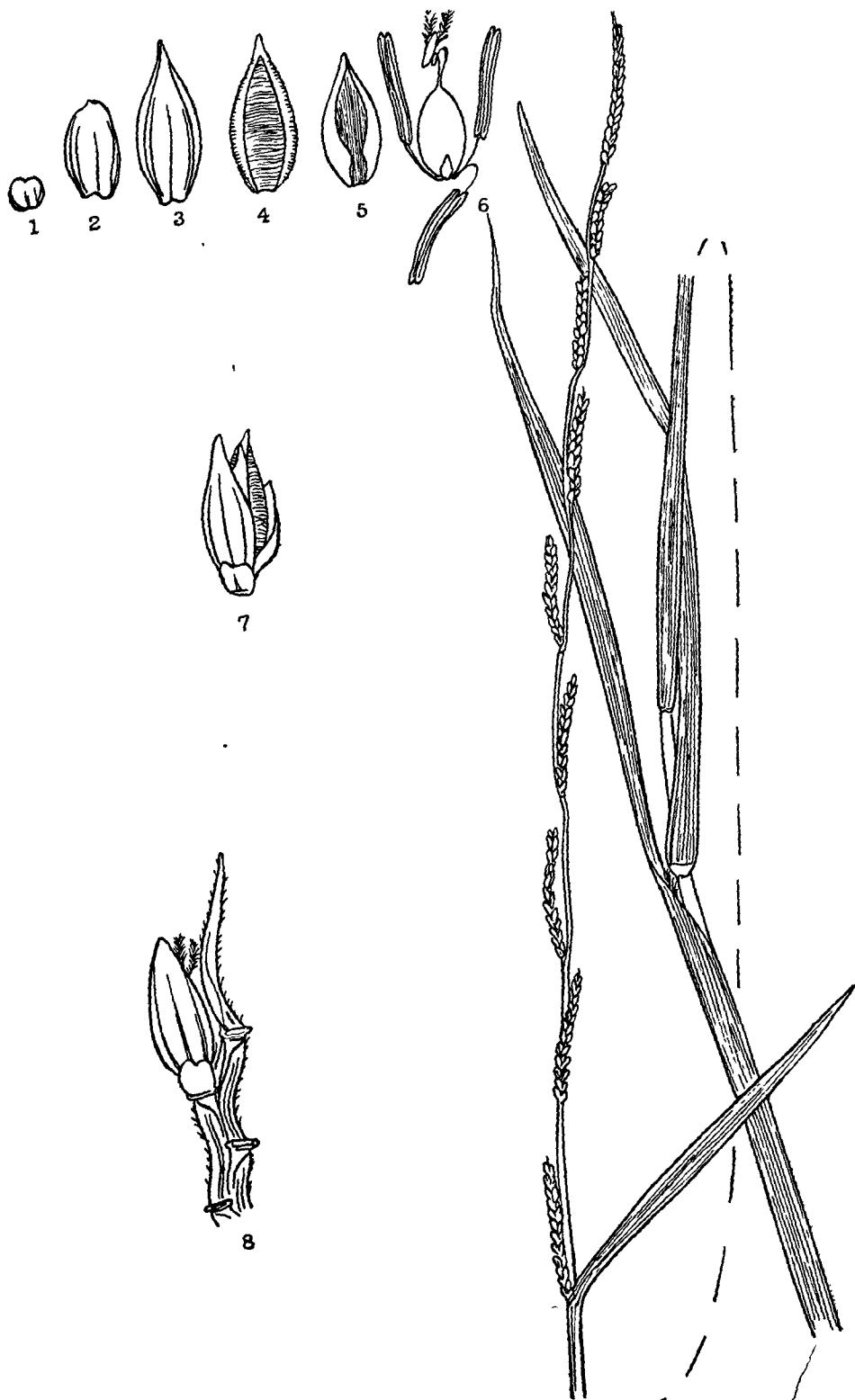
P. burgudum Cheval. Sudania (1911) 25.

Paspalum appressum Lam. Ill. I, 176.

Digitaria appressa Pers. l. c. 85.

D. affinis Roem. & Schult. Syst. II (1817) 470.

Etymology : *Geminatum* means in pairs, alluding to the biseriate spikelets.



PASPALIDIUM PUNCTATUM A. CAMUS

Delin. E. K. Bhude.

Description : Perennial; stem 0.3-1.2 m. long, from a stout creeping base, often as thick as a swan's quill, smooth, soft, striate, lower nodes 5-12.5 cm. long, quite glabrous. Leaves 10-20 cm. by 6-10 mm., linear, finely acuminate, glabrous, the margins smooth or nearly so, often incurved, base narrow; sheaths large, loose, glabrous, the margins not ciliate; ligule a ridge of hairs.

Panicle 20-30 cm. long, rhachis erect, angular, glabrous or nearly so. Spikes many, 1.3-3.8 cm. long, sessile, longer than the internodes, often appressed to the rhachis; rhachis of spike flattened. Spikelets 2.5-3 mm. long, ovoid, acute, glabrous, 2-seriate, imbricate. Glumes 4; lower involucre glume 1.2 mm. long, broader than long, thinly membranous, without nerves, white; upper involucre glume ovate, acute, concave, thinly membranous, with 5-7 green nerves, slightly shorter than the upper floral glume; lower floral glume subcoriaceous, 5-7-nerved, paleate, empty or male, upper floral glume broadly ovate, mucronate, thinly coriaceous, smooth or nearly so, palea with inflexed membranous margins.

Locality : *Sind*: Munchar Lake (Stocks *teste* Cooke); Tatta (Blatter & McCann D611 & D612 !).

Cutch: Anjar, tank (Blatter 3745 !)

Kathiawar: Porbandar (Bhude !).

Gujarat: Lasandra (Chibber !); Ahmedabad, canal banks (Sedgwick !).

Khandesh: Dhulia (Chibber !), Borod, growing in water, partly submerged (McCann A97 !).

Konkan: Mahaluxmi (Sabnis 5449 !); Bandra, opposite Kantwadi, sandy shore (Vakil A99 !), Victoria Gardens (McCann A100 !); common in Bombay Island (McCann !).

W. Ghats: Igatpuri (Blatter & Hallberg 5492 !).

Deccan: Poona, Bund Gardens (Garade 343 !); Ahmednagar, sides of stream Dangar Guy (T. Cooke 6 !), Manmad, river-bed (Blatter A94 !), Sholapur, Tank, in water (D'Almeida A95 !), Pashan (Gammie !).

S. M. Country: Dharwar (Sedgwick 3692 !); Shiggaon (Sedgwick 2081 !).

N. Kanara: Halyal (Talbot 2149 !).

Ecology : Growing in or near water, usually in marshy places. It varies in colour from pale green to purple. The plant varies according to the depth of water it is growing in.—A more aquatic species than *P. flavidum* with long floating internodes which branch at the nodes. The floating internodes are hollow. The spikes are more closely arranged and are usually longer than the internodes. The rhachis is setulose, much more so than in *P. flavidum*, in which latter species it is microscopically setulose.

Distribution : More or less throughout India, Ceylon, Afghanistan, Arabia, tropical Africa and America.

50. *UROCHLOA* Beauv.

Perennial or annual. Leaves linear to lanceolate, flat, ligules a ciliate rim.

Racemes sessile or subsessile on a common axis, simple or nearly so, rhachis more or less triquetrous with a low almost straight or zigzag facial angle or keel, rarely strap-shaped; pedicels solitary or in pairs, alternately to the right and the left of the facial angle, usually reduced to short disc-tipped stumps, or if binate the primary slightly longer. Spikelets close, contiguous or slightly discontinuous, 2- or irregularly pluri-seriate, glabrous or hairy, broad-ovate to elliptic or lanceolate-oblong, awnless, usually more or less flattened or slightly depressed abaxially, convex on the back, falling entire from the pedicels, solitary or binate or in fascicles of 3-4, secund and abaxial on the rhachis. Involucre glumes similar and subequal or more often dissimilar and very unequal in length, the lower being the shorter, upper resembling and more or less equalling the lower floral glume, 5-11- (mostly 7-) nerved. Lower floral glume 5-7-, rarely more-nerved, the inner lateral nerves somewhat distant from the midnerve, palea subequal to the glume, with well-developed inflexed flaps and sharp sometimes marginate keels; upper floral glume elliptic to rotundate-elliptic in outline, very obtuse, with a usually scabrid or barbellate mucro, narrowly involute, 5-7-nerved, palea almost as long as the glume, 2-keeled, the sides tightly embraced by the valve all along. Lodicules 2, small, broadly cuneate. Stamens 3; styles distinct; stigma plumose, laterally exserted upwards. Grain tightly enclosed by the glume and palea, broadly to rotundate-elliptic, dorsally compressed.

"Very similar to *Brachiaria*, but with the orientation of the spikelets inverted and a short fine mucro from the very obtuse apex of the fertile valve. Although very similar in general appearance, none of the species of *Urochloa* can be said to approach closely members of the genus *Brachiaria*. Their affinities are clearly *inter se*, suggesting a distinct line of evolution. The occurrence of parallel states, one with glabrous, the other with pubescent spikelets, but otherwise indistinguishable, runs almost through the whole genus. To this may be added

the presence of a submarginal fringe in the lower floret, almost normal in some and very rare in other species, and apparently in no case correlated with other characters." (Stapf l. c.)

Species about 18.—Hot parts of the Old World, one in America, but perhaps introduced.

Cooke describes 3 species of *Panicum* which belong here *Panicum prostratum* Lamk., *P. setigerum* Retz., and *P. javanicum* Poir., to which we add *Urochloa marathensis* Henrard.

- A. Spikelets up to 2 mm. long 1. *U. reptans*.
 B. Spikelets 2.5-5 mm. long
 1. Spikelets lanceolate, acuminate 2. *U. setigera*.
 II. Spikelets ovate to elliptic-oblong.
 1. Leaves about 3 cm. long Racemes 2 cm. long . . 3. *U. marathensis*.
 2. Leaves 3.5-15 cm. long. Racemes 2.5-5 cm. long . 4. *U. Helopus*.

1. UROCHLOA REPTANS Stapf.

PLATE 32

Urochloa reptans Stapf in Fl. Trop. Afr. IX (1920) 601; Haines Bot. Bih. and Or. (1924) 1003. *Panicum reptans* Lam Syst. Nat. ed. X, 870, Hrtshch. & Chase in Contrib. U. S. Nat. Herb. XV, 36, fig. 17 (excl. *P. grossarum*).

P. reptans N. L. Burm. Fl. Ind. (1768) 26, t. II, fig. 1; Rottl. in Neue Schrift. IV, 182; Roxb. Fl. Ind. I (1832) 300, Boj. Hort. Maur. 364 (non Lam.)

P. prostratum Lam III, I, 171, Miq. Fl. Ind. Bat. III, 446, Griseb. Fl. Brit. W. Ind. (1864) 546; Schweinf. in Bull. Herb. Boiss. II, App. II, 20, Baker Fl. Maur. (1877) 435; Duthie Last Grasses N. W. Ind. (1883) 6, III, Indig. Fodder Grasses (1886) t. 45, Fodder Grasses N. Ind. (1888) 11; Boiss. Fl. Or. V (1884) 438; Dalz. & Gibs. Bomb. Fl. (1861) 290; Hook. f. Fl. Brit. Ind. VII (1896) 33, Cooke Fl. Bomb. II (1908) 932; Merrill in Philipp. Journ. Sc. I, 355.

P. barbatum Lam. l. c.

P. caespitosum Sw. Fl. Ind. Occ. II, 146.

P. Sieber Link Hort. Berol. I (1627) 207.

P. procumbens var. Nees Agrost. Bras. 169.

P. oraspum Llanos Fraga. (1851) 42.

P. vulgare Steud. Syn. Pl. Glum. I (1855) 61.

P. calacanzense Steud l. c. 65.

P. vurchanum Hale in Wood Class. ed. III, 787.

P. vaticum Salz. ex Doell in Mart. Fl. Bras. II, II, 155.

P. marginatum Vahl ex Hook. f. l. c.

Bracharia prostrata Griseb. in Abh. Ges. Wiss. Goett. VII, 263.

Vernacular names : Chumachara, Surpur chaurela.

Etymology : *Urochloa* is derived from *ura*, a tail, and *chloa*, a grass, therefore a tailed grass.—*Reptans* means creeping, alluding to the stem creeping below.

Description : A slender annual grass; stem 10-45 cm. long, ascending from a long creeping base, often branched below; nodes pubescent; internodes 2.5-7.5 cm. long. Leaves 2.5-5 cm. by 6-16 mm., ovate-lanceolate from a cordate amplexicaul base, acuminate, thin, flat, nearly glabrous or quite glabrous above, often clothed with long hairs beneath, sometimes nearly glabrous, sheaths slender, with ciliate margins, ligule a tuft of white hairs or 0.

Racemes 5-8, alternate, secund, 1.3-3.2 cm. long, sessile or shortly pedunculate, distichously spreading; rachis of racemes slender, angular. Spikelets 1.6-2 mm. long, solitary or binate, secund, ellipsoid, somewhat turgid, subacute, glabrous or hairy; pedicels very short, with long slender hairs at the tip below the spikelet. Glumes 4; lower involucral glume minute, semilunate, hyaline, nerveless; upper involucral glume about equalling the lower floral glume, membranous, broadly ovate, acute, pubescent, 7-nerved; lower floral glume 5-nerved, empty, with hyaline palea, upper floral glume elliptic, dorsally rounded, thinly coriaceous, finely striolate, nearly white, with subconcolorous palea. Anthers 0.8 mm. long.

Locality : *Gujarat* : Ahmedabad, famine grass plot, Bedar (Herb. Gujarat College 1); Ghad, on black soil (Sedgwick 1124 1).

Khandesh : Nandurbar, (Mamlatdar of Nandurbar 1); Umalla, Tapti bank (Blatter & Hallberg 5229 1), Bor, Tapti (Blatter & Hallberg 4417 1).

Konkan : Vasco da Gama (Bhide 1); Matunga, salt pans (Sabinis 9572 1); Byenlla (McCann 9577 1).

Deccan : Kinkee (Bhide 1); Poona (Herb. Econ. Bot. Poona 1); Deolali (Blatter A107 1), Shelapur (D'Almeida A108 1 A109 1).



UROCHLOA REPTANS STAPF

Drawn: B. K. Bhada



UROCHLOA HELOPUS STAFF.

Desm: B. K. E

S. M. Country : S. W. of Dharwar, 1,800 ft., rainfall 90 in (Sedgwick & Bell 4437 !), Dharwar, under trees on black soil, 2,400 ft., rainfall 34 in. (Sedgwick 2382 !)

Ecology : This grass has generally a creeping stem which roots at the nodes. The habit is more erect when the plant grows in rich cultivated ground.

Distribution : Plains of India, Ceylon, tropics generally, subtropical America, also tropical Arabia and the Mascarenes.

Economic uses : Considered to be one of the most nutritious fodder grasses. Cattle are fond of it. It yields a considerable quantity of grain which is eaten in times of scarcity.

Explanation of Plate 92 : *Urochloa reptans* Stapf

1. Spikelet.
2. Lower invol. glume
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume
6. Upper floral glume.
7. Palea of upper floral glume
8. Stamens, ovary, styles and lodicules

2. UROCHLOA SETIGERA Stapf

Urochloa setigera Stapf in Fl. Trop. Afr. IX (1920) 598, Haines in Bot. Bih. and Or. (1924) 1003.

Panicum setigerum Retz. Obs. IV (1786) 15, Roxb. Fl. Ind. I (1832) 299, Kunth Enum. I (1838) 90 (excl. syn. nonnullis), Hook. f. Fl. Brit. Ind. VII (1896) 37; Cooke Fl. Bomb. II (1908) 933.

P. affine Pour. Encycl. Suppl. IV, 273 (ex Kunth).

Etymology : *Setigera* means having bristles or awns.

Description : Stems 60-90 cm. long, prostrate and widely straggling below, branched, slender, firm; nodes bearded, the lower rooting; internodes 2.5-5 cm. long. Leaves 7.5-12.5 by 1-2.2 cm., ovate-lanceolate from a cordate, amplexicaul, more or less ciliate base, finely acuminate, flat, thin, with slender midrib, 5-6 pairs of nerves and scabrid margins; sheaths glabrous except at the back beneath the leaf-blade, with ciliate margins; hglue a tuft of long woolly hairs.

Inflorescence of 3-10 racemes 2.5-5 cm. long, the lower very distant, alternate; rachis of racemes angular, glabrous or pubescent, villous at the base. Spikelets 2.5-3 mm. long, loosely imbricate, 2-seriate (one often pedicellate, the other sessile), secund, ovoid, acute or acuminate, glabrous or pubescent, pedicels pubescent and with long spreading slender hairs on or below the pedicel. Glumes 4, lower involucrel glume about $\frac{1}{3}$ as long as the upper, orbicular, thinly membranous, upper involucrel glume broadly ovate, acute or acuminate, 7-nerved, membranous, lower floral glume about equal to the upper involucrel glume, 5-nerved, paleate, neuter, the palea membranous, as long as the glume, subacute; upper floral glume elliptic, obtuse, shortly apiculate, coriaceous, granulate, with narrowly incurved margins, the palea coriaceous, elliptic-oblong, obtuse.

NOTE —We do not think there is any good reason for retaining Hook. f.'s var. *tomentosa* which was also mentioned by Cooke loc. We refer to the note given above after the general characteristics of the genus and add what Stapf says with regard to this species in particular "The African specimens have glabrous spikelets. In India, however, the pubescent form appears to be prevalent."

Locality : Sind · Mirpur Sakro (Blatter & McCann D609 !); Ghara (Blatter & McCann D610 !)

Kathnawar : Raykot (Woodrow 45 teste Cooke).

Khandesh : Dhuha (Herb. Econ. Bot. Poona !).

Konkan : Bassein (Paranjpye !).

Deccan : Ganeshkhind Bot. Gardens (Herb. Econ. Bot. Poona !), Mangin Farm, 11 miles S. E. of Poona (Herb. Econ. Bot. Poona !).

Ecology : Subgregarious, growing amongst bushes and in the shade of trees. "When exposed to the weather the leaves are of a smooth shining deep green, when under trees, of a pale colour, soft and somewhat downy, which made me long think they were different species." (Roxburgh).

Distribution : India, Ceylon, Mauritius, tropical and S. Africa.

Economic uses : Cattle are fond of the grass.

3 *UROCHLOA MARATHENSIS* HENR.

Urochloa marathensis Henr. in Mededeel. Rijks Herb. 43 (1922) 1-3, pl. 1.

Panicum marathense Henr. in Herb. Lugd. Bat.

Description : Annual, dwarf and robust, glaucous, branching from the lower geniculations. Stems low, striate, quite glabrous, few-noded, nodes pubescent. Leaf-sheaths terete or slightly compressed, striate, lower ones gaping, upper ones tight, shorter than the internodes, hirsute with bulbous-based hairs. Ligule very short, covered with long hairs. Blade cordate at the base, linear-lanceolate, gradually acutate, more or less 3 cm. long, 5-7 mm. broad, flat, on both sides but especially on the upper sparingly covered with spreading bulbous-based hairs, margin thickened, distinctly undulate, fimbriate with long tubercular hairs.

Racemes 2-3, distant from each other more or less 1 cm., 2 cm. long, stout, erect-patulous or finally reflexed, rhachis subtrigonous, pilose at the base, more than twice as narrow as the spikelets, slightly undulate, the angles scaberulous, otherwise glabrous, giving off solitary pedicels. Spikelets biserial, broadly elliptic, very acute, 4 mm. long, anteriorly almost flat, posteriorly very convex, green, glabrous. Involucral glumes very unequal. Lower almost $\frac{1}{2}$ of the spikelet, subobtusate, 5-nerved, upper as long as the spikelet, very acute, distinctly 7-9-nerved. Lower floral glume equal in shape to the upper involucral glume, flat, 5-nerved. Glabrous on the back, tubercular-echinulate near the margin, except near the tip and base, paleate.

Upper floral glume shorter than the preceding glumes, elliptic with a rounded tip, rigid, opaque, brown-straw-coloured, rugulose, long caudate, 5-nerved, bullate below.

NOTE.—Henrard has a variety from the same localities, *var. ichuina*, which differs from the type by the densely pubescent spikelets. What we said in a note under the previous species can be applied here.

Locality : S. M. Country and N. Kanara (A. P. Young ex Henrard). We have not seen the specimen.

Distribution : So far endemic.

4. *UROCHLOA HELOPUS* Stapf.

PLATE 93.

Urochloa Helopus Stapf in Fl. Trop. Afr. IX (1920) 595; Haines Bot. Bih. and Or. (1924) 1002.

U. pubescens Kunth Rev. Gram. I (1829) 31, Enum. Pl. I (1838) 74.

U. panicoides Schult. Mant. II, 595 (non Beauv.).

Panicum Helopus Trin. in Spreng. Neue Entdeck. II, 84; Panic. Gen. 150, et Gram. Ic. et Descr.

II, t. 183, Nees Agrost. Bras. 117; Steud. Syn. Pl. Glum. I (1855) 57; Duthie List Grasses

N. W. Ind. (1883) 4, Fodder Grasses N. Ind. (1888) 8.

P. Helopus var. *glabrescens* K. Schum. in Engl. Pf. Ost.-Afr. C. 101, Stapf in Dyer Fl. Cap. VII, 392.

P. hirsutum Koen. ex Roxb. Fl. Ind. I (1832) 300.

P. Koenigii Spreng. Syst. I (1825) 311.

P. hochstetterianum A. Rich. Tent. Fl. Abyss. II (1851) 369.

P. geminatum Hochst. ex A. Rich. l. c. (non Forsk.).

P. controversum Steud. Syn. Pl. Glum. I (1855) 60; Schweinf. in Bull. Herb. Boiss. II, 19.

Setaria ? *hirsuta* Kunth Rev. Gram. I (1829) 47, Enum. Pl. I (1838) 157.

S. pilifera Spreng. Syst. IV, Cur. Post 33.

Panicum javanicum Hook. f. Fl. Brit. Ind. VII (1896) 35, (non Poir., partim); Cooke Fl. Bomb. II (1908) 933 (partim).

This is the species which was described by Hook. f. and many others, amongst them by Cooke, under the name of *Panicum javanicum* Poir. According to Stapf *P. javanicum*, frequently confused with *U. Helopus*, is *U. panicoides* Beauv., a distinct species. A number of synonyms and references have, according to the same authority, to be excluded from the F. B. I. under *Panicum javanicum*. Bentham's Flora of Australia (VII, 476) mentions *Panicum Helopus*, but it is partly *Brachiaria notochlona* Stapf (*Panicum notochlonum* Domin) and partly *Brachiaria ramosa* Stapf. T. 7 in Duthie's Fodder Grass. does not represent *Panicum Helopus*, but *Brachiaria ramosa* Stapf. *Urochloa panicoides* Beauv. is a synonym of *Panicum javanicum* Poir. *P. trichopus* Hochst. is *Urochloa trichopus* Stapf.

P. Helopus represents the state with pubescent spikelets. The pubescent state is predominant in India. Specimens with pubescent spikelets and at the same time an appressed silvery fringe to the lower floret were collected by Jacquemont near Poona. The presence or absence of a hairy vestiture in the spikelets does not appear to be correlated with any other characters, but it has to be observed that the spikelets of the specimens from the African mainland are on the whole slightly larger and more acute than those from India (Stapf).

As a number of foreign elements have crept into the usual descriptions of our species we give Stapf's description of *U. Helopus*

Vernacular names : Kuri, Kuriya

Description : Annual. Stems tufted, 30-60 cm high, erect or gemmately ascending from a short sometimes rooting base, frequently sparingly branched from the lower nodes, 4-10-noded, intermediate internodes like the uppermost (peduncle) very sparingly pubescent or almost glabrous. Leaf-blades lanceolate to linear-lanceolate from a wider and semi-amplexicaul base, 3.5-15 cm. by 8-12 mm., rarely up to 25 cm. and then linear and narrowed towards the base, soft, flat, pale or yellowish-green, loosely and often finely hirsute with tubercle-based hairs, rarely almost glabrous, margins usually crisped or wavy and more or less ciliate. Sheaths somewhat loose, pale, striate, densely ciliate upwards, more or less shortly hirsute with the hairs tubercle-based, nodes pubescent to subvillous. Ligules a densely ciliate rim.

Inflorescence of mostly 4-7 erect or at length more or less spreading stiff or slightly flexuous sessile or subsessile spiciform secund racemes, common axis 1.2-5 (rarely 7.5 cm) long, subsemiterete below, much flattened upwards, pubescent. Racemes moderately dense, 2-seriate, simple, 2.5-5 cm long, solitary or here and there approximate and then unevenly distributed; rhachis straight or slightly wavy, flat on the back, about 1 mm wide, villous at the base, glabrous upwards, rarely sparingly hairy, angles scabrid; internodes up to 1 mm long, pedicels solitary, reduced to short stout stumps with discoid tips, frequently bearing some long spreading hairs. Spikelets laterally contiguous or subcontiguous, ovate to elliptic-oblong, very acute, 4-5 mm. long, greenish, glabrous or pubescent. Involucral glumes dissimilar, lower broad-ovate, subobtusate to acute, clasping at the base, 1.5-2 mm long, glabrous or sparingly and minutely pubescent, 5-nerved, upper one corresponding in size and outline to the spikelet, prominently 7-11- (mostly 9-) nerved, glabrous or pubescent. Lower floral glume very similar to the upper involucral glume, but flat or slightly depressed, 5-7-nerved with the inner side nerves distant, glabrous or pubescent, palea oblong, acute, slightly shorter than its glume. Anthers 2 mm long. Upper floral glume rotundate-elliptic, greenish to pale brown, 2.5-3 mm. long, palea finely transversely rugose or granular, mucro up to 1 mm long, sparingly barbellate. Grain rotundate-elliptic in outline, much compressed, about 2 mm. long, yellowish or greenish.

Locality : Gujarat : Baroda (Cooke *teste* Cooke).

Deccan : Katraj Ghat, 11 miles S E of Poona (Shevade !); Poona (Woodrow !); Deolali (Blatter A110 !); Ganeshkhind Bot Gardens (Patwardhan !); Chattarshunji (Bhude !), Mangri, near Poona (Gammie 15344 !), Dapuri, near Poona (Jacquemont 482 !), Akola (Mamlatdar of Akola !).

S. M. Country : Dharwar, 2,500 ft, rainfall 35 in. (Sedgwick 2157!); Kilgerry (Talbot 2419 !); Haveri (Talbot 2284 !); Bijapur (Meebold 11201 !), Badami (Woodrow *teste* Cooke).

N. Kanara : Kulgi, 2,000 ft. (Talbot 2283 !); Nundgod (Mamlatdar of Nundgod).

Ecology : Grows on the borders of, and in cultivated land, and on pasture ground.

Distribution : Plains of India, Ceylon, tropical and S Africa, Mauritius

Economic uses : Considered to be a good fodder both for cattle and horses.

Explanation of Plate 93 : *Urochloa Helopus* Stapf

1. Part of rhachis and spikelet.
2. Lower invol. glume.
3. Upper invol glume
4. Lower floral glume
5. Palea of lower floral glume.
6. Stamens.
7. Upper floral glume
8. Palea of upper floral glume.
9. Stamens, ovary, styles and lodicules.

51. ECHINOCHLOA Beauv.

Annual or perennial. Leaf-blades from a slightly constricted or equally wide rarely much attenuated base. Ligules 0 or represented by a transverse fringe of hairs.

Panicles of crowded or loosely arranged secund spiciform branches mostly bearing spikelets from the base or near it. Spikelets ovate to elliptic- or lanceolate-oblong, usually cuspidate or awned, very convex on the back, flat or slightly depressed in front, falling entire from the pedicels, 2-nate or clustered, secund and abaxial on the triquetrous rhachis of racemously arranged false spikes. Involucral glumes unequal, membranous, the lower much shorter, more or less ovate from a clasping base, 3-5-nerved, often mucronate, the upper corresponding in length and outline to the spikelet (as seen from the back), very concave, 5-7-nerved, acute,

cuspidate or cuspidate, rarely produced into a short awn. Lower floret equalling the upper glume (excluding cusps or awns), lower floral glume very similar to the upper involucre glume, but flat or depressed on the back and often with a more pronounced cusp or an awn; palea equal to the body of the valve, or in barren florets more or less reduced, hyaline, finely 2-keeled. Upper floral glume ovate to elliptic-oblong, apiculate or obtuse, very convex on the back, subcoriaceous or crustaceous, polished, faintly 5-nerved, margins firm, involute up to near the tip, then flat, not embracing the tip of the palea, palea subequal to the glume and similar in substance, with rounded keels and flaps which thin out towards the flat slightly recurved tips. Lodicules 2, cuneate, fleshy. Stamens 3. Styles distinct; stigmas plumose, exerted from near the tips. Grain broad-elliptic, dorsally flat, ventrally convex, hilum punctiform, subbasal.

Species about 20-25.—The warm regions of both hemispheres.

NOTE.—It will be useful to remember what Stapf says regarding this genus 1 a 605 "The segregation of the numerous forms which make up the genus *Echinochloa* and their reduction to more or less well definable species is still unsatisfactory, mainly owing to their apparently endless variability and the difficulty, if not impossibility, of discriminating between stable and unstable modifications and the effects of hybridisation. Here, as in other cases, observation in the field and experiment will have to decide."

Cooke describes under *Panicum* 2 species which have to be referred to *Echinochloa*: *P. colonum* and *P. stagninum*. We add *E. Crus-Galli* which Cooke thought did not occur anywhere in the Bombay Presidency.

- | | |
|--|--------------------------|
| I. Lower involucre glume and upper floral glume equally acute or cuspidate | 1 <i>E. colona</i> . |
| II. Lower involucre glume and upper floral glume cuspidate or produced into an awn, the latter more than the former. | |
| 1 Ligule 0 | 2 <i>E. Crus-Galli</i> . |
| 2 Ligule a fringe of stiff hairs or absent in the uppermost leaves | 3 <i>E. stagnina</i> . |

1 *ECHINOCHLOA COLONA* Link.

PLATE 94

Echinochloa colona Link Hort Berol II (1827) 209, Parl Pl. Nov. 40; Hitchc. in Gray Man. Bot. ed. 7, 118, et in Contrib. U. S. Nat. Herb. XII, 213, XVII, 256, XVIII, 345; Stapf in Fl. Trop. Afr. IX (1920) 607, Haines Bot. Bih. and Or. (1924) 997.

E. zonalis Parl. Pl. Panorm. I, 119

Panicum colonum Linn Syst. Veg. ed. 10 (1759) 870, Sp. Pl. ed. II, 84, Jacq. Eclog. Gram. t. 32, Roxb. Fl. Ind. I (1832) 296, Nees Agrost. Bras. 119, Steud. Syn. Pl. Glum. I (1855) 46, Benth. Fl. Hongk. (1861) 411, et Fl. Austral. VII (1878) 478; Griseb. Fl. Brit. W. Ind. (1864) 545, Baker Fl. Maurit. (1877) 438, Duthie Last Grasses N. W. Ind. (1883) 3, Indig. Fodder Grasses (1886) t. 4, Fodder Grasses N. Ind. (1888) 4, Boiss. Fl. Or. V (1881) 435; Balf. f. Bot. Socotra (1888) 310, Hack. in Bol. Soc. Brot. VI, 140; Schweinf. in Bull. Herb. Boiss. II, App. II, 20, 95, Hook. f. Fl. Brit. Ind. VII (1896) 32, Cooke Fl. Bomb. II (1908) 931.

P. arabicum Nees ex Steud. Nomencl. ed. II (1840) 252, et Syn. Pl. Glum. I (1855) 63 (*partim*).

P. brizoides Linn. Mant. II (1767) 184

P. tetrastrichon Forsk. Fl. Aegypt.-Arab. (1775) 19

P. cuspidatum Roxb. Fl. Ind. I (1832) 298, Duthie Grasses N. W. Ind. (1883) 3; Steud. l. c. 47

P. pseudocolonum Roth Nov. Sp. (1821) 47, Steud. l. c. 46.

P. zonale Guss. Ind. Sem. H. R. Bocc. 1825, et Fl. Sic. Prodr. I, 82.

P. numidicum Presl Cyp. and Gram. Sic. 19 (*non* Lam.).

P. Daltoni Parl. ex Webb in Hooker Niger Fl. (1841) 185.

P. equitans Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 365.

P. Crus-Galli var. *colonum* Coss. Glum. Expl. Alger 28

P. Petiveri Kotsch. ex Griseb. l. c. (*non* Trin.).

Vernacular names: Borur, Pakud, Pacushama, Sawank, Tor, Todia, Jima.

Etymology: *Echinochloa* is derived from *echinus*, hedgehog and *chloa*, grass.—*Colonum* means a cultivator of the ground, colonist.

Description: Annual, stem 30-60 cm. long, slender, decumbent or shortly creeping below, nodes glabrous or puberulous. Leaves 10-20 cm. by 4-8 mm., narrowly lanceolate or linear, acuminate, flat, glabrous, with scaberulous margins, sheaths up to 15 cm. long; ligule 0.



ECHINOCHLOA COLONA LINK.

Desm: B. K. Bhida.



ECHINOCHLOA CRUS-GALLI P. BEAUV.

Spikes 8-20, suberect, usually distant, 1.3-2.5 cm. long, rhachis stout, angular, scaberulous on the angles. Spikelets 2-2.5 mm long, globose ovoid, acute or subcuspidate, more or less hispidly pubescent, secund, sessile, 3-5-seriate. Glumes 4, lower involucre glume about half as long as the lower floral glume, broadly ovate or suborbicular, membranous, 3-nerved, ciliate, upper involucre glume about equal to the lower floral glume, broadly ovate, cuspidate, concave, 5-7-nerved, hairy, lower floral glume similar, empty, with a hyaline palea; upper floral glume coriaceous, broadly ovate, turgid, acute, finely striolate, polished, yellowish white, with a coriaceous palea.

Locality : *Sind* (Blatter !), Karachi (Nankad !), Mirpurkhas (Bhude !, Sabnis B1176 !); Larkana, barren plains (Sabnis B93 ! B95 ! B457 !), Sanghar (Sabnis B894 ! B899 !), Nasarpur, clayey soil (Sabnis B1048 !), Mirva Canal, Khairpur Mirs (Sabnis B263 !), Khairpur Mirs (Sabnis B337 !); Sehwan to Laki (Sabnis B63 !), Hyderabad (Sabnis B49 !), Pad-Idan (Sabnis B516 !), Chuar Ch (Blatter & McCann D616 ! D621 !), Baghar (Blatter & McCann D617 !); Mirpur Sakro (Blatter & McCann D618 ! D620 !), Ghulamalla (Blatter & McCann D619 !), Shikarpur (Woodrow)

Cutch Anjor, brackish water (Blatter 3743 !).

Gujarat Lasandra (Chibber !), Ahmedabad (Cowper !)

Kathiawar Morvi (Woodrow)

Khandesh Muravat, Tapti bank (Blatter & Hallberg 4435 !), Bor, Tapti Island (Blatter & Hallberg 4439 !), Dadgaum (McCann A104 !), N slope of Chanseli (McCann A105 !).

Konkan Bombay, salt swamps (Woodrow !), Vetora (Sabnis 33589 !); Bombay, Charni Road (Sabnis 4292 !), Bombay, very common (McCann !), Alibag, rice-fields (Ezekiel !)

W Ghats Igatpuri (Blatter & Hallberg 5478 !, McCann 4331 !), Khandala, very common (McCann A101 !), Castle Rock (McCann A106 !); Londa (Woodrow)

Deccan Purandhar Fort (Bhude !, McCann 5520 !), Nira Canal, Poona Dist. (Chibber !), Sholapur (D'Almeida A102 !), Deolali (Blatter A103 !), Poona, canal (Ezekiel !).

S M Country Dharwar (Sedgwick 2655 !)

N Kanara Dongri Nallah (Talbot !); Karwar (Talbot 614 !)

Ecology : This grass is commonly found in rich cultivated fields and on the banks of fields after the crops have been cut away. Afterwards it sometimes occupies the whole field.

Distribution : Throughout the plains of India, Ceylon, all over the tropics and the warm temperate regions of the world. Probably of African and Indian origin according to Stapf.

Economic uses : The grain is used for food by the poorer people. The grass is considered one of the best grasses in India. Before and after flowering it is greedily eaten by all kinds of cattle.

Explanation of Plate 94 : *Echinochloa colona* Link.

1. Spikelet and part of rhachis
2. Lower invol glume
3. Upper invol glume.
4. Lower floral glume and palea.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, grain, styles and lodicules

*VAR. FRUMENTACEA BLATTER & MCCANN.

Echinochloa colona var. *frumentacea* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 647.

Echinochloa frumentacea Link Hort. Berol. I, 204, Aitchis. Cat Panjab Pl (1869) 161.

Panicum frumentaceum Roxb. Fl. Ind. I (1832) 304, Schult. Mant. II, 230; Trin. Sp. Gram. Ic. t. 164, Duthie Grasses N W Ind. (1883) 4, Field & Gard Crops 3, t 24, Fodder Grasses N. Ind. (1888) 8.

P. Crus-Galli var. *frumentaceum* Trin. Cat. Ceyl. Pl. (1885) 104.

Echinochloa Crus-Galli var. *frumentacea* Haines in Bot. Bh. and Or. (1924) 998.

Panicum stagninum Retz. var. *frumentacea* Cooke in Cooke Fl. Bomb II (1908) 931.

Oplismenus frumentaceus Kunth Rev. Gram. I (1829) 45, Enum. Pl. I (1838) 146, Dalz. & Gibs Bomb. Fl. Suppl. (1861) 98.

Stapf is of opinion that *Panicum frumentaceum* Roxb. is evidently descended from *Echinochloa colona*.

Vernacular names : Shamula, Sawan, Shama, Samuka, Suma, Sanwak. Saon saron, Bavto, Same, Sawo

Etymology : *Frumentaceum* is derived from *frumentum*, produce, especially of the various kinds of cereals, hence corn, grain

Description : Tall, robust. Stems erect, from 60-120 cm. high.

Panicle often nodding. Spikes secund, incurved, crowded. Spikelets mostly 3-nate, unequally pedicelled, one at least sessile, varying from hispidulous to almost glabrous, and from acute to cuspidate or rarely distinctly cuspidate.

Locality : Cultivated in and near the Ghat districts

Ecology : It grows rapidly, coming to maturity 6 weeks after sowing. In N. India it is cultivated as a rainy season crop, mostly near and at low elevations on the hills.

Distribution : Cultivated over the greater part of India, on the Himalaya up to 6,500 ft.

Economic uses : The grain is eaten chiefly by the poorer classes. It is eaten either boiled in milk, or parched. In the Himalayas the ears are first cut, and the stalks afterwards given to cattle (Duthie).

2. ECHINOCHLOA CRUS-GALLI P. Beauv.

PLATE 95.

Echinochloa Crus-Galli P. Beauv Agrost. (1812) 161, T. Nees Gen. Fl. Germ. Monocot. I, t. 21; Reichenb. Ic. Fl. Germ. I, t. 29, fig. 1411, 1412; Hitchc. in Contr. U. S. Nat. Herb. XII, 213, Stapf in Fl. Trop. Afr. IX (1920) 610; Haines Bot. Bih. and Or. (1924) 998

E. commutata Schult. Mant. II, 267.

E. hispidula Nees in Royle III. Bot. Himal. 416; Dalz. & Gibs. Fl. Bomb. Suppl. (1861) 98.

Panicum Crus-Galli Linn. Sp. Pl. ed. I, 56; Fl. Dan. t. 1564; Host Gram. Austr. II, 15, 19; Knapp Gram. Brit. XI, Trin. Sp. Gram. Ic. t. 161, 162; Nees Fl. Afr. Austr. (1841) 58; Steud. Syn. Pl. Glum. I (1855) 47; Benth. Fl. Austr. VII (1878) 479 (*partim*); Duthie List Grasses N. W. Ind. (1883) 3 (*partim*); t. A. fig. I, Boiss. Fl. Or. V (1884) 435; Hook. f. Fl. Brit. Ind. VII (1896) 30 (*partim*); Stapf in Dyer Fl. Cap. VII, 397.

P. hispidum Forst. Prodr. 7, Nees Agrost. Bras. 257.

P. hispidulum Retz. Obs. V (1791) 18; Lam. Ill. I, 171; Roxb. Fl. Ind. I (1832) 303; Nees Fl. Afr. Austr. (1841) 57; Royle l. c. 420; Steud. Syn. Pl. Glum. I (1855) 47.

P. oryzinum Gmel. Syst. I, 157

P. stagninum Host Gram. Austr. III, t. 51 (*non* Retz.).

P. Hostii Marsch. Bieberst. Fl. Tauro-Cauc. III, 57.

P. limosum Presl ex Nees Agrost. Bras. 257.

Milium Crus-Galli Moench Meth. (1795) 202.

Ophismenus Crus-Galli Dumort. Agrost. Belg.; Kunth Rev. Gram. I (1829) 44, et Enum. I (1838) 143 (*excl. syn. P. zonale*).

O. limosum Presl Rel. Haenk. I (1830) 321; Kunth Enum. I, 144.

Orthopogon Crus-Galli Spreng. Syst. I (1825) 307.

O. Retzii Spreng. l. c.

Vernacular names : Bovar, Pacad, Sarvank.

Etymology : *Crus* means a leg, *Galli* means of a cock.

Description : Annual, up to 1 m. high. Stems geniculately ascending, branched below, compressed towards the base, glabrous and smooth, internodes enclosed or exserted. Leaf-blades linear, base scarcely narrowed, narrowed to an acute point, 7-25 cm. by 6 to over 12 mm., flat, subfiaccid, glabrous, more or less dull greyish-green, smooth or scaberulous below, particularly towards the tip, margins finely cartilaginous, scabrid, to almost smooth. Sheaths somewhat loose, the lower often compressed, whitish and thin, the upper subherbaceous, all smooth, glabrous and striate except the basal which are pubescent above their insertion. Ligules 0, junction of blade and sheath glabrous inside marked by a brown zone.

Panicles erect, strict or flexuous, at length exserted, 7.5-20 cm. long; axis triquetrous scabrid, branches few to about 15, solitary or 2-nate, suberect or spreading, distant except the uppermost or all more or less approximate forming a 'lobed' panicle, the lower 2.5-6.2 cm. long, forming rather stout dense mostly many-ranked simple or subcomposite subsecund sessile false spikes, rhachis triquetrous, scabrid, coarsely bristly, particularly near the nodes, pedicels fascioled or 2-nate, very short, up to 1 mm. long, scabrid, bristly at the base, tips subdiscoid. Spikelets crowded, ovate-elliptic in outline, acute, cuspidate or awned 2.5-3 mm. long, greenish or tinged with purple. Lower involucre glume membranous, very broadly ovate, clasping at the base, obtuse to subcuspidate, 1 mm. long, 5-nerved, scaberulous; upper herbaceous-membranous, very broadly ovate-oblong, concave, acute, cuspidate, as long as the spikelet, 5- or (near the tip) 7-nerved, rigidly pubescent between the scabrid and spinulose nerves. Lower floral glume similar to the upper involucre glume, but flat or depressed on the back, cuspidate or produced into a scabrid often long flexuous awn, 7-nerved (at least at the tip), palea elliptic shorter by $\frac{1}{4}$ than its glume, keels scaberulous upwards; upper floret

hermaphrodite, elliptic-ovate in outline, cuspidate, over 2 mm. long, whitish or yellowish, polished, glume and palea subcoriaceous. Anthers oblong. Grain broad-elliptic in outline, 1.5 mm long

Locality : *Sind*. Mirpurkhas (Bhude !), Ghulamalla (Blatter & McCann D613 !); Keti (Blatter & McCann D614 !)

Gujarat Stream near Prantij (Sedgwick !), the Bokh, Prantij Taluka (Sedgwick 1144 !)

Deccan Poona (Woodrow !).

S. M. Country Aluarar, 2,000 ft., rainfall 35 in. (Sedgwick 3096 !); Bidi, 2,500 ft., rainfall 50 in (Sedgwick 3076 !).

N. Kanara Halyal (Talbot 2167 !)

Ecology : A sporadic species. Very common in marshes in the Mallad tract of the Carnatic. Grows on the borders of rice-lands and rich moist places.

Distribution : Common through the greater part of India and Malaya; as a weed throughout the warm temperate countries of the northern hemisphere, rather rare in the tropics of Africa and the New World and south of the tropic of Capricorn (Stapf).

Economic uses : The grain is used as food by the lower classes. The grass when young is hiked by cattle, especially by buffaloes.

See Duthie Fodder Grasses N. Ind. 6; Vasey Agric. Grasses Unit. States, ed. II, 27; Maiden Man. Grasses N. S. Wales, 38-41; Yearbook U. S. Dept. Agric. (1902) 580-582.

Explanation of Plate 95 : *Echinochloa Crus-Galli* P. Beauv.

- 1 Lower invol. glume
- 2 Upper invol. glume
- 3 Lower floral glume.
4. Palea of lower floral glume.
5. Stamens and lodicules
- 6 Upper floral glume
7. Palea of upper floral glume.
- 8 Stamens, ovary and styles
- 9 Spikelets.

3. ECHINOCHLOA STAGNINA Beauv.

Echinochloa stagnina P. Beauv. Agrost. (1812) 161, Stapf in Fl. Trop. Afr. (1920) 617.

E. scabra Roem. & Schult. Syst. II, 479.

Panicum stagninum Retz. Obs. V (1789) 17; Roxb. Fl. Ind. I (1832) 295; Grah. Cat. Bomb.

Pl. (1839) 237, Nees Agrost. Bras. 261, Trin. Pan. Gen. 128, et in Mém. Acad. Pétersb.

6me sér. III, 216, Steud. Syn. Pl. Glum. I (1855) 47, Stapf in Dyer Fl. Cap. VII, 394;

Cooke Fl. Bomb. II (1908) 930.

P. scabrum Lam. Ill. I, 171, et Encycl. IV, 744; Nees l. c.; Steud. l. c.

P. Galli Thunb. Prodr. (1784) 18, et Fl. Cap. ed. I, 389, ed. Schult. 103.

P. Crus-Galli Woodrow in Journ. Bomb. Nat. Hist. Soc. XIII (1901) 433 (non Lunn).

P. Crus-Galli var. *stagninum* Fenzl. in Ind. Sem. Hort. Berol. 1850, Hook. f. in Trin. Fl. Ceyl. V, 136, Prain Beng. Pl. 1174.

P. Crus-Galli vars. *maximum*, *submuticum* et *leuostachyum* Franch. Contr. Fl. Congo Franc. in Bull. Soc. Hist. Nat. Autun VIII, 347.

P. pictum Nees Fl. Afr. Austr. 59 (1841) (non Agrost. Bras.).

P. Burgu A. Cheval. in Rev. Cult. Colon. VII, 513-520.

P. Lechevrea A. Cheval. l. c. 516

P. oryzetorum A. Cheval. l. c.

Orthopogon stagninus Spreng. Syst. I (1825) 307.

Ophismenus stagninus Kunth Rev. Gram. I (1829) 44, et Enum. I (1838) 144 (*partim*), Dalz. & Gibs. Fl. Bomb. (1861) 292.

O. scaber Kunth Rev. Gram. l. c. 44, Enum. l. c. 145.

Vernacular name : Banti

Etymology : *Stagnina* is the adjective formed from *stagnus*, pond.

Description : Annual or perennial; root-fibres many, long, wiry, with numerous filiform rootlets; stem erect from a geniculate or prostrate base, reaching 1.5 m. (or more) long, sometimes rooting from the lower nodes. Leaves 15-45 cm. by 3-13 mm, linear, tapering to a fine point, sheaths striate, smooth, glabrous; ligule a fringe of stiff hairs.

Panicle 10-20 cm. long; rhachis slender, more or less flexuous, angular, grooved, scabrid on the ridges and with scattered bristles, branches few or many, distant or close, alternate, usually suberect, 2.5-5 cm. long, sessile or nearly so with a tuft of hairs at the base; rhachis of the branches angular, grooved, clothed sparingly with bulbous-based hairs. Spikelets crown-

ed, ovoid-lanceolate, 4-5 mm. long (excluding the awn), hairy with bulbous-based hairs, pale; pedicels very short with enlarged tips. Glumes 4, lower involucrel 2.5 mm. long (half as long as the spikelet), broadly ovate or suborbicular, cuspidate, 3-nerved, hairy and ciliate, thinly membranous, upper involucrel glume 5 mm. long (including the mucro), broadly ovate, concave, hairy and ciliate with bulbous-based hairs, thinly membranous, 7-nerved in the upper part with green nerves, acuminate or produced into a short compressed scabrid awn; lower floral glume like the upper involucrel glume with an awn varying from 0.4-2.5 cm. long, paleate, male, the palea hyaline, as long as the glume; upper floral glume 4 mm. long, ovate-lanceolate, mucronate, straw-coloured, shining, faintly striolate, with involute margins, coriaceous, palea as long as the glume, elliptic-oblong, acute, striolate, with inflexed margins.

The leaves are always marked with purple bands which occasionally disappear in dried specimens

Locality : *Sind* · Ghulamalla (Blatter & McCann D615 !).

Konkan · Virar, on bank of a tank (McCann 9584 ! 9585 !).

W. Ghats · Igatpuri (Blatter & Hallberg 5473 !), Khandala, in water in the smaller village tank (McCann 27441 !), Panchgani (Blatter & Hallberg B1241 !)

S. M. Country · Huklop, 2,000 ft., rainfall 50 in (Sedgwick 3175 !); Chikkerur, Taluka Kod, water hole by road (Sedgwick 1969 !), Bomigatti, tank (Sedgwick 3830 !), common in the Carnatic (Sedgwick)

N. Kanara · Pardham (Talbot 3136 !)

Ecology : This grass is commonly found in small stagnant pools and on the bank of lakes and tanks. Very common in marshes in the Carnatic

Distribution : More or less throughout India, Ceylon, tropical and S. Africa

Economic uses : Considering tropical African conditions Stapf observes (l. c. 619) · "This grass deserves every attention on account of its locally abundant supply and high sugar-content. Chevalier states that it is the most useful of all the plants growing in a wild state in the neighbourhood of Timbuctu. Every part of it is utilised. It yields excellent fodder, material for thatching and caulking, is burned to produce a salt used in the manufacture of soap and indigo, the grains are eaten. . . and the canes are gathered for extracting sugar or preparing vinaigre or a beverage resembling cider. Sir John Kirk also describes it as one of the richest of fodder grasses. Although typically a perennial with long rhizomes creeping in the mud of swamps, lakes and rivers, it seems on temporarily flooded land to flower frequently the first year and then to behave as an annual."

52. OPLISMENUS Beauv.

Slender leafy weak grasses, stems creeping below, branches ascending. Leaves ovate-lanceolate, acuminate, thin, flat, margins scaberulous, base narrow, auricled on one side; ligule a ridge of long hairs

Spikelets solitary or 2-nate, disarticulating at the base, in small clusters or in spike-like more or less secund racemes along a common axis, subterete, awned. Glumes 4; involucrel glumes similar, more or less subequal, herbaceous to membranous, 3-7-nerved, both usually with straight awns; lower floral glume resembling the upper involucrel glume, 5-9-nerved, empty, mucicous or very shortly awned, with or without a hyaline 2-nerved or more or less reduced palea, upper floral glume 2-sexual, as long as or shorter than the lower, chartaceous to coriaceous, 5-7-nerved, mucicous, palea of similar texture, about equal to the glume, 2-nerved. Lodicules 2, minute, cuneate. Stamens 3. Styles distinct, long, stigmas exserted at the top of the glume. Grain oblong-ellipsoid, free within the hardened glume and palea

Species about 15 — In the warmer parts of the world, but mostly tropical

- | | |
|--|--------------------------|
| 1. A tall branching grass, awns stout, smooth, obtuse | 1. <i>O. compositus</i> |
| 2. A small diffuse grass, awns capillary, minutely scaberulous | 2. <i>O. Burmannii</i> . |

1. OPLISMENUS COMPOSITUS P. Beauv.

PLATE 96

Oplismenus compositus P. Beauv. Agrost. (1812) 54, Duthie Grasses N. W. Ind. (1883) 81; Hook f. Fl. Brit. Ind. VII (1896) 66; Lisboa Bomb. Grasses (1896) 27, Cooke Fl. Bomb. II (1906) 926. Haines Bot. Bih. and Or. (1924) 999, Stapf in Fl. Trop. Afr. IX (1920) 634.

O. elatior L' Beauv. Agrost. l. c. 54, 168.

O. indicus Willd. in Act. Acad. Nat. Cur. IV, 224.

O. sylvaticus Roem. & Schult. Syst. II (1817) 481.



OPLISMENUS COMPOSITUS P. BEAUV.

Delm. B. K. I.



OPLISMENUS BURMANNI P. BEAUV.

- O. pratensis* Schult. Mant. II, 597.
O. Jacquum Kunth R v. Gram. I (1829) 14, Enum. Pl. I (1838) 140.
O. lanceolatus Kunth ll. cc. 45, 146; Dalz. & Gibs. Bomb. Fl. (1861) 292.
O. decompositus Nees in Endl. Prodr. Fl. Norfolk (1833) 19.
O. africanus Wood Natal Pl. t. 165.
Panicum compositum Linn. Sp. Pl. (1753) 57.
P. elatus Linn. f. Suppl. (1781) 107.
P. aristatum Retz. Obs. IV (1786) 17.
P. lanceolatum Retz. Obs. V (1789) 17, Roxb. Fl. Ind. I (1832) 294.
P. sylvaticum Lam. Encycl. IV, 733, Trin. Gram. Ic. et Descr. t. 190, fig. A.
P. compositum prozumum Rottl. in Gesellsch. Naturf. Fr. Neue Schr. IV (1804) 224.
P. peninsulatum, *certificandum*, *longeracemosum*, *undatum*, *bidentatum* Steud. Syn. Pl. Glum. I (1855) 44, 45.
Andropogon undatus Jacq. Coll. III, 237, and Ic. Pl. Rar. III, t. 631.
Orthopogon compositus R. Br. Prodr. (1810) 194.
O. remotus Trin. Fund. Agrost. (1820) 181.
O. pratensis Spreng. Syst. Veg. I (1825) 306.
O. Junghuhnii, *longeracemosus*, *syloaticus* Miq. Fl. Ind. Bat. III, 343.
Echinochloa lanceolata Roem. & Schult. Syst. II, 476.
Digitaria composita Willd. Enum. Berol. I, 91.

Vernacular names : Turdia, Shora.

Etymology : *Ophiomenus* is derived from *hophsmenos*, being armed, alluding to the awns.

Description : A tall branching grass; stems 30-90 cm. long, slender, branched, and creeping below, branches ascending, leafy, rooting from the lower nodes. Leaves variable, 5-15 cm. by 13-20 mm. ovate to ovate-lanceolate, acuminate, thin, flat, glabrous or hairy, base narrow, auricled on one side, sheaths glabrous or pubescent, with ciliate margins.

Panicle 7.5-25 cm. long; peduncle long or short; branches of panicle usually distant, 2.5-7.5 cm. long; rhachis glabrous or pubescent, angular, grooved. Spikelets distant, 4 mm. long (excluding the awn), lanceolate-ellipsoid, green; pedicels very short, often with a tuft of hairs at the base. Glumes 4, lower involucrel glume ovate-lanceolate, acuminate 2.5 mm. long (without the awn, which is about 5 mm. (or more) long and truncate at the apex, glabrous, often purple), 5-nerved, membranous, upper involucrel glume 3 mm. long (including a short mucro or awn), rather broader than the lower involucrel glume, 5-7-nerved, membranous; lower floral glume, 4 mm. long, membranous, broadly ovate, subacute, the midrib prolonged behind into a very short apiculation, 7-9-nerved with a very narrow palea, upper floral glume shorter than the lower, ovate-oblong, acute, coriaceous, smooth, shining with incurved margins; palea oblong, acute, with strongly involute margins.

Locality : *Khandesh*. Toranmal (McCann 9593 !).

Konkan. At the foot of the Ghats under the shade of trees (Dalzell & Gibson); Bassein (Chibber 164 !); Kanari Caves (McCann 9445 !); Sion, woods (Blatter 9591 !), Thana (Lisboa).

W. Ghats. Igatpuri (McCann 4342 !), Matheran, to Lousa Point (D'Almeida A244 !, Woodrow), Khandala, common in forests (McCann 5335 !); Lonavla (Lisboa); Panchgani, Tiger path (Blatter & Hallberg B1253 !), Castle Rock (Blide !, McCann !), Londa (Woodrow !).

S. M. Country. Forests west of Dharwar (Sedgwick & Bell 1853 !); Bidi, shade of trees (Sedgwick & Bell 2962 !).

N. Kanara. Yellapur (Talbot 736 !); Karwar (Talbot 1322 !); Goond (Talbot 2204 !); Amshi Ghat (Talbot 2192 !); Kadgal (Woodrow).

Ecology : Grows generally under the shade of trees. Very common in and near forest of the Carnatic and N. Kanara.

Distribution : Throughout India, Ceylon, tropical and subtropical Asia, Africa, Australia and Polynesia.

Economic uses : Roxburgh says that cattle are not fond of the grass.

Explanation of Plate 96 : *Ophiomenus compositus* P. Beauv.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Grain.
8. Spikelets.

2. OPLISMENUS BURMANNII P. Beauv.

PLATE 97.

Oplismenus Burmannii Beauv. Agrost. (1812) 54; Dalz & Gibs Bomb Fl (1861) 291; Duthie Grasses N W Ind (1883) 8, III. Indig. Fodder Grasses (1886) t 47, Fodder Grasses N. Ind. (1888) 13, Hook f Fl Brit Ind. VII (1896) 68; Lisboa Bomb. Grasses (1896) 27; Cooke Fl. Bomb. II (1908) 927, Haines Bot. Bih and Or. (1924) 999, Stapf in Fl. Trop. Afr. IX, 636.

O. Burmannii var. *albidulum* N. E. Br. in Gard. Chron. XXVI (1886) 776.

O. albus Roem. & Schult. Syst. II, 890.

O. bromoides P. Beauv. l. c.

O. humboldtianus Nees. Agrost. Bras 264

O. cristatus Presl Rel Haenk I (1830) 223, Hitchc. in Contr. U S. Nat. Herb. XVII, 255.

O. affinis Presl l. c.

O. Preslei Kunth Enum. I (1838) 140.

O. indicus Duthie Grasses N. W Ind. (1883) 8 (non Roem. & Schult.).

O. africanus Rendle in Cat Afr. Pl. Welw. II, 184

Panicum Burmannii Retz Obs. III (1783) 16; Roxb. Fl. Ind. I (1832) 295.

P. bromoides Lam III I, 170

P. hirtellum N L. Burm. Fl. Ind. t. 12, fig. 1 (non Linn.).

P. multisectum Hochst. ex A. Rich. Tent. Fl. Abyss II (1851) 377.

P. japonicum Steud in Flora (1846) 18

Orthopogon albus Nees ex Steud Syn. Pl Glum. I (1855) 14.

O. Burmannii Miq. Fl. Ind. Bat. III, 442.

Vernacular names : Kudak, Yerwa.

Etymology : R L Burmann (1707-1780) was a Dutch professor of Botany; he wrote a Flora Indica in 1768.

Description : A very slender diffusely branched leafy grass, stem 15-45 cm. long; nodes glabrous or hairy. Leaves 2-5 cm by 6-13 mm., ovate, or ovate-lanceolate, acuminate, sparsely pilose with long slender white hairs, sheaths glabrous or hairy.

Panicle 2.5-6.3 cm long; peduncle slender (almost filiform), usually very long, branches of panicle, spike-like, few, distant, subsessile, 4-20 mm long; rachis slender, angular, clothed with long slender white hairs nearly as long as the spikelets. Spikelets 2-5 mm long (excluding the awns), secund, solitary or 2-nate; pedicels short, hairy. Glumes 4, lower involucreal glume 1-6 mm long (excluding the acute scaberulous capillary awn which reaches 8 mm. long), ovate, obtuse, 3-5-nerved, hyaline, silky-hairy and ciliate, upper involucreal glume similar and subequal to the lower, 5-nerved, with an awn reaching 5 mm. long; lower floral glume reaching 2-5 mm. long (excluding an awn of about 1-2 mm. long), broadly ovate, subobtusate, concave, hyaline, silky-hairy, and ciliate, 7-9-nerved, empty, epaleate; upper floral glume as long as the lower, ovate, acute, membranous, with incurved margins; palea as long as the glume, membranous, ovate-oblong, acute, with strongly involute margins.

Locality : Gujarat - Surat, shady places (Sedgwick 314 !).

Konkan - Versova (McCann 4313 !); Alibag, sandy shore, on the roots of coconut trees (Ezekiel !), Bombay Isl (McCann !); Parel (Herb. Dehra Dun !, Woodrow).

W. Ghats : Igatpuri (McCann !); Khandala, very common, forming carpets under trees (McCann 9592 !); Lonavla (McCann 3898 !), Panchgani (Woodrow); Castle Rock (Gammie 15696 !), Londa (Gammie 15826 !).

Deccan - Chakan (Gammie !).

S. M. Country : S. W. of Dharwar (Sedgwick & Bell 4438 !); Dharwar, shade of trees (Sedgwick 1837 !)

N Kanara - Halyal (Talbot 2085 !); Karwar (Talbot 1295 !).

Ecology : Grows chiefly under the shade of trees and in cultivated ground in the plains or at low elevations on the hills.

Distribution : Widely distributed throughout the tropics of both hemispheres.

Economic uses : According to Duthie cattle eat this grass with relish, while it is young. It makes good hay.

Explanation of Plate 97 : *Oplismenus Burmannii* P. Beauv.

1. Lower invol. glume
2. Upper invol glume
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelets.

53. HYMENACHNE Beauv.

Rather stout grasses. Leaves broadly linear.

Panicles thyrsoid, branches erect, appressed with spiciform branchlets and very numerous crowded narrowly lanceolate acuminate secund spikelets, articulate on their minute pedicels. Lower involucre glume cuspidate, keeled, membranous, shortest, upper with sheathing amplexicaul base on the long internode of the rachilla between it and the lower floral glume, prominently 3-nerved, cuspidate or awned. Lower floral glume longest, lanceolate-acuminate, passing gradually into the awn, with 3 strong nerves meeting in the base of the awn and 2 lateral weaker ones, empty, upper longer than upper involucre glume, oblong, membranous in flower, scarcely hardened in fruit, smooth, faintly 2-nerved, embracing the palea except at the tip, palea similar and as long. Lodicules minute. Stamens 3. Styles free.

Species 7 or 8—Tropics and subtropics, mostly American.

This genus is not represented in Cooke. The following species is described in the Fl. Brit. Ind. under *Panicum myurus* H. B. & K.

1. HYMENACHNE MYUROS Beauv.

Hymenachne myuros Beauv. Agrost. (1812) 49, t. 10, fig. 8 (excl. syn. Lam.), Nees Agrost. Bras. 275; Griseb. Fl. Brit. West Ind. (1864) 553 (excl. syn.), Steud. Syn. Pl. Glum. (1855) 78, Haines Bot. Bih. and Or. (1924) 991.

Panicum myurus H. B. & K. Nov. Gen. et Sp. I, 98 (excl. syn. Lam.), Kunth Rev. Gram. I (1829) 33, Enum. Pl. I (1838) 86, Suppl. 65, Duthie Fodder Grasses N. Ind. (1888) 10 (excl. syn.), Benth. Fl. Austral. VII (1878) 480 (excl. syn. interruptum). (Excl. in omnibus syn. Lam., Rudge, Richard, Trin.); Hook. f. Fl. Brit. Ind. (1896) VII, 39.

P. acutiglumum Steud. Syn. Pl. Glum. (1855) 66.

P. auratum Hassk. Pl. Rar. Jav. (1848) 22 (non Presl).

P. Hasskarlii Steud. in Zoll. Syst. Verz. 54, Syn. Gram. 70, Miq. Fl. Ind. Bat. III, 456.

P. myurum Meyer Fl. Esseg. 50 (excl. syn. Lam. & Rudge).

P. mangaloreum Steud. l. c. 78.

P. serrulatum Roxb. Fl. Ind. I (1832) 307, Kunth Enum. Pl. I (1838) 126.

Agrostis monostachys Poir. Encycl. Suppl. I, 256, ex Kunth l. c.

Vernacular name : Pokahia

Etymology : *Hymenachne* is derived from the Greek *hymen*, a membrane, and *achna*, chaff, husk.

Description : Culm stout, tall, 0.6-1.8 m. high, spongy below, rooting at the nodes of the prostrate base, erect, leafy. Leaves 20-50 cm. by 18-25 mm., flat, tapering from a broad cordate base to a fine point, margin serrulate, sheath smooth, glabrous or ciliate, ligule very short, rounded, hyaline.

Panicle very dense, narrow, very compound with closely appressed branches, 15-30 cm. long, rarely 25 mm. diam, often interrupted, sometimes quite cylindrical. Spikelets variously grouped, shortly and unequally pedicelled, secund on the erect branches of the panicle, 4-6 mm. long, narrowly lanceolate, pale green. Lower involucre glume $\frac{1}{2}$ of the lower floral glume, narrow from an amplexicaul base, aristulate, hispidulous on keel and cusp, upper narrowly lanceolate, subaristate, hispidulous, 3-nerved. Lower floral glume much longer than upper involucre glume, narrowly lanceolate, gradually tapering into the awn as long as spikelet, strongly 3-nerved, hispidulous on nerves, palea imperfect or 0, upper small, thin, narrow, finely acuminate, almost embraced by the lower, shorter than the upper involucre glume, enclosing its palea on the edges. Styles distinct.

Locality : S. M. Country Tadas, tanks, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4917!).

Ecology : This is a gregarious species. Grows in marshy places and damp ravines. Found in forest tanks in the Mallad tract of the Carnatic.

Distribution : Tropical Asia, Australia and America.

Economic uses : Not a good fodder grass. In Australia considered to be nutritious to cattle.

54. PANICUM Linn.

Annual or perennial grasses, rarely suffrutescent, of various habit and size. Leaves mostly linear to linear-lanceolate, but also ovate or filiform to subulate. Ligules usually reduced to a ciliate rim or a fringe of hairs, rarely a distinct membrane or 0.

Panicles usually much divided and at least temporarily open. Spikelets usually loosely scattered, glabrous or hairy, lanceolate to oblong, elliptic or orbicular in outline, symmetrical in profile, rarely somewhat oblique, falling entire or almost so from the often elongated pedicels of a compound or decompound panicle, without a definite orientation towards the axis.

Involucral glumes more or less herbaceous-membranous, lower usually shorter than the upper, often very much so, rarely equalling it, usually with 1 or more nerves, or if very small, nerveless; upper as long as the spikelet, rounded on the back, 5-9-nerved. Lower floral glume very similar to the upper involucral glume and equally rounded and curved on the back, 5-9-, rarely 3- or 11-nerved, male or neuter, palea thinly membranous to subhyaline, subequal to the lower floral glume or more or less reduced, rarely suppressed. Upper floral glume subcoriaceous to coriaceous with firm margins, obtuse to subacute, emucronate, faintly nerved, hermaphrodite, palea subequal to the glume and of similar substance, tightly embraced by the more or less involute margins of the glume. Lodicules 2, broadly cuneate. Stamens 3. Styles distinct; stigmas laterally exerted near the tip of the floret. Grain tightly enclosed by the hardened valve and valvule, dorsally compressed, biconvex to almost plano-convex, scutellum elliptic to ovate-elliptic, about half as long as the grain, hilum subbasal, punctiform.

Species about 400.—In the tropical and subtropical regions of both hemispheres, few in the warm-temperate regions.

Cooke mentions 20 indigenous and 4 cultivated species.

Of the 24 species we have put *Panicum flavidum* Retz., *P. punctatum* Burm., and *P. fluitans* under *Paspalum*.

Panicum stagninum Retz. and *P. colonum* Linn. have been transferred to *Echinochloa*.

Panicum Isachne Roth, *P. ramosum* Linn. and *P. muticum* Forsk. belong to *Bracharia*.

Panicum prostratum Lamk., *P. setigerum* Retz., and *P. javanicum* Poir. have been described under *Urochloa*.

Panicum interruptum Willd. and *P. myosuroides* will be dealt with under *Sacciolepis*.

Panicum patens Linn. will be transferred to *Cyrtococcum*.

New to the Presidency are *P. pilopodium* Trin. and *P. auratum* Presl.

- A. Lower involucral glume as long as the lower floral glume or nearly so 1. *P. turgidum*.
- B. Lower involucral glume shorter than the lower floral glume.
- I. Annuals.
1. Leaves less than 12 mm. broad.
 - a. Panicle about 35 cm. long 2. *P. obscurum*.
 - b. Panicle not more than 25 cm. long.
 - aa. Spikelets gaping 3. *P. trypheron*.
 - bb. Spikelets not gaping 4. *P. pilopodium*.
 2. Leaves more than 12 mm. broad.
 - a. Spikelets 4-5-5 mm. long 5. *P. muticum*.
 - b. Spikelets 2-3-2 mm. long 6. *P. mutare*.
- II. Perennials.
1. Lower involucral glumes very minute, one or rarely both often obsolete. 7. *P. subeghina*.
 2. Lower involucral glumes distinctly evident.
 - a. Culms up to 3 m. high 8. *P. maximum*.
 - b. Culms less than 1.7 m. high.
 - aa. Culms not more than 90 cm. high 9. *P. paludosum*.
 - bb. Culms more than 90 cm. high.
 - + Spikelets laxly clustered on the branches 10. *P. antidotale*.
 - ++ Spikelets solitary 11. *P. montanum*.
 - +++ Spikelets fascicled, subsecund, sessile or shortly pedicelled 12. *P. auratum*.

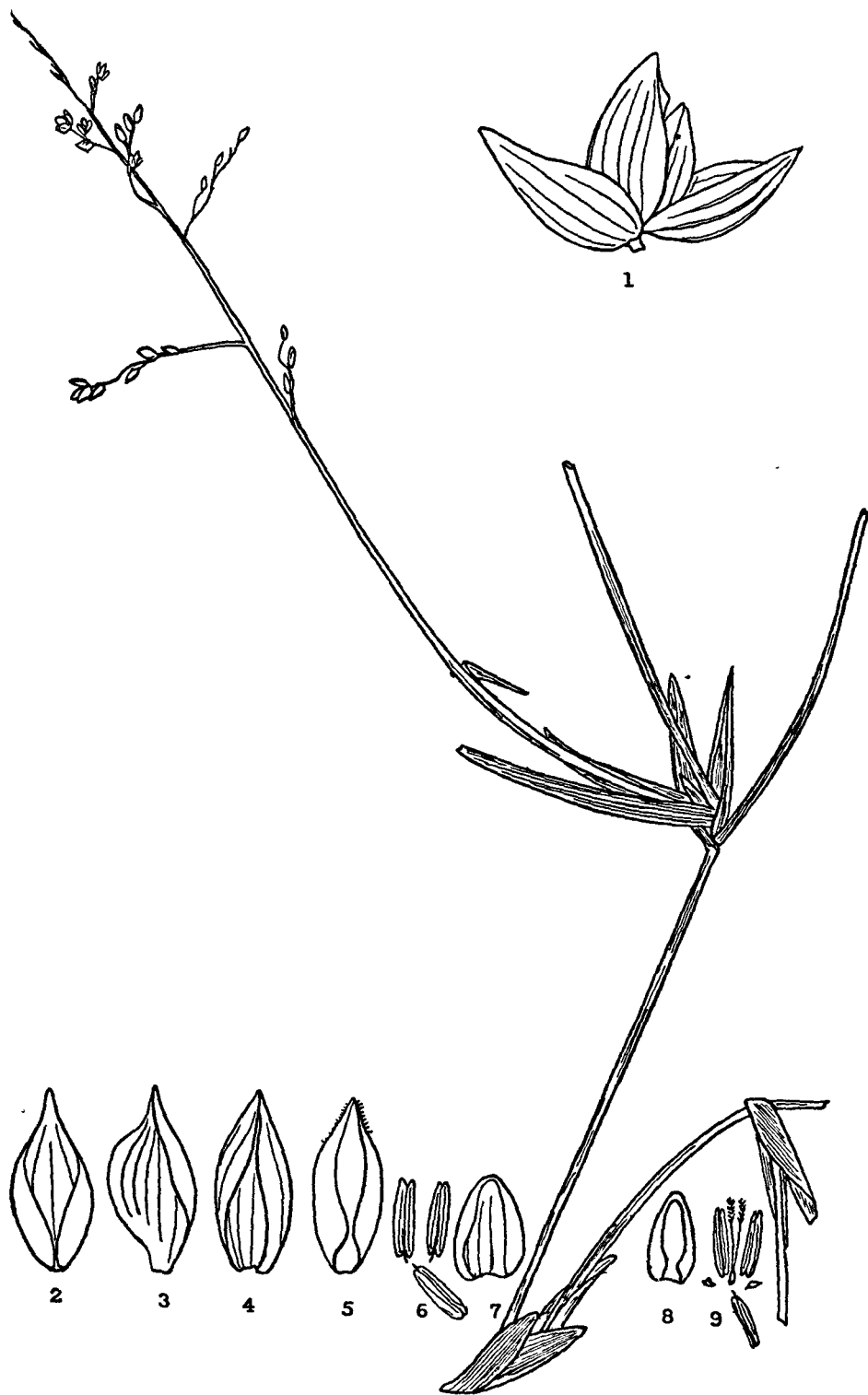
1. PANICUM TURGIDUM Forsk.

PLATE 98.

Panicum turgidum Forsk. Fl. Egypt.-Arab. (1775) 18; Del. Fl. Egypte (1812) 19, t. 9, fig. 2; Trin. Diss. Gram. Pan. 189, Gram. Icon. and Descr. II, 227, Pan. Gen. 221, and in Mém. Acad. Pétersb. sér. VI, III, 307, Kunth Enum. I (1838) 97, Steud. Syn. Pl. Glum. I (1855) 88; Boiss. Fl. Or. V (1884) 441; Duthie Fodder Grasses N. Ind. (1888) 13; Balf. f. Bot. Socotra (1888) 310; Hook. f. Fl. Brit. Ind. VII (1896) 44; Stapf in Kew Bull. (1907) 214; Muschler Man. Fl. Egypt. I (1912) 57; Cooke Fl. Bomb. II (1908) 935; Stapf in Fl. Trop. Afr. IX (1920) 706.

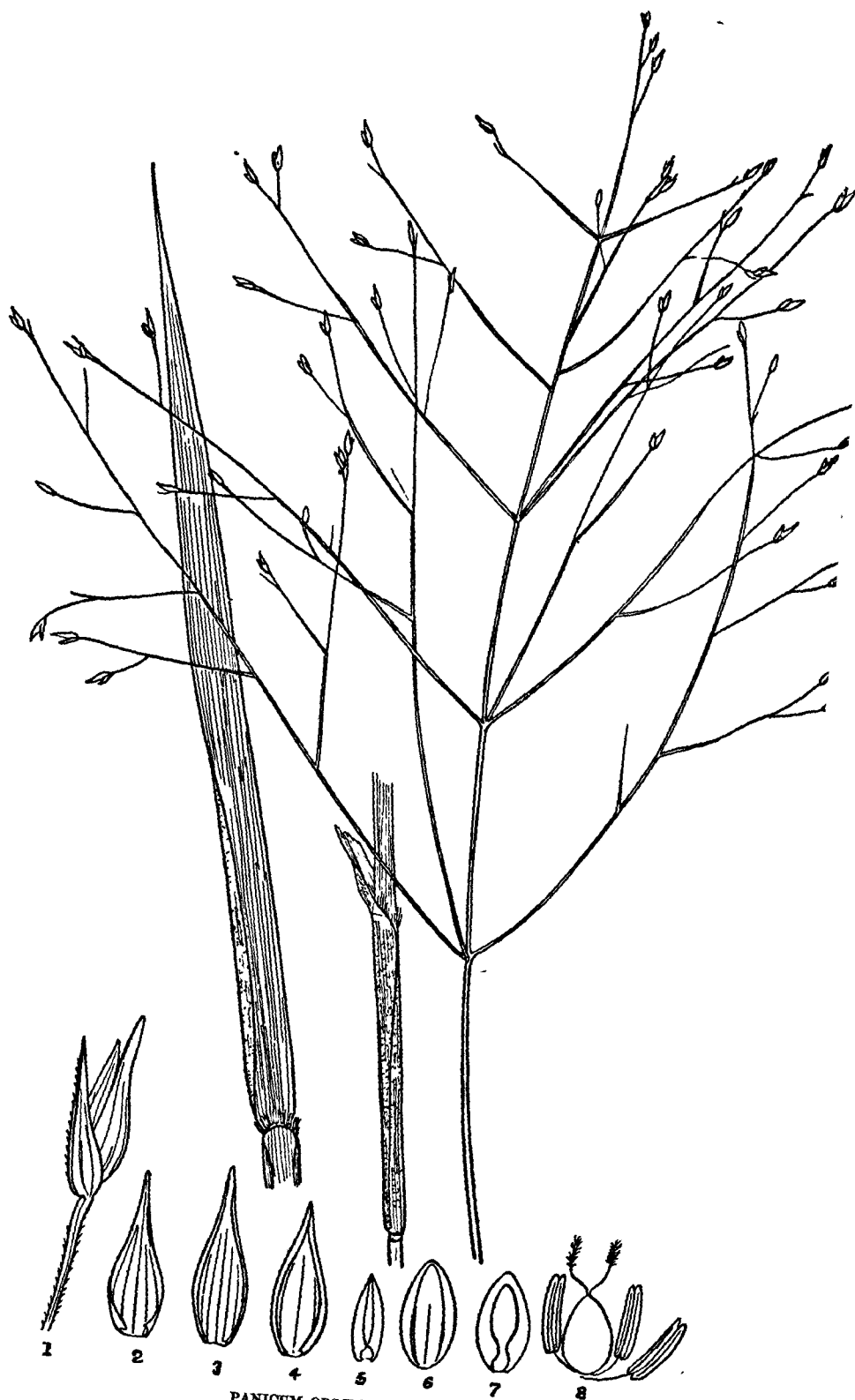
P. nubicum Fig. & De Not. in Mem. Ac. Torino. ser. 2, XIV, t. 21, figs. 1-12.

Etymology: *Panicum* may have been derived from *panis*, bread, or *panicula*, panicle.—*Turgidum* means turgid, swollen.



PANICUM TURGIDUM FORSK.

Desm: B. K. Bhude.



PANICUM OBSCURANS WOODROW.

Description : Perennial, glabrous, glaucous, rootstock sometimes as thick as the little finger, root-fibres thick, velvety; stem hard (bamboo-like), solid, smooth and polished, 2.5-3 mm diam. about the middle, emitting from the nodes fascicles of branches in tufts from a swollen base. Leaves few, those at the base of the stem and branches 2.5-7.5 mm. long, flat, coriaceous, linear-lanceolate, acuminate, smooth, those of the upper nodes often reduced to open chartaceous sheaths with a setiform blade.

Panicle terminal, subpyramidal, 3.8-10 cm. long, branches at first erect, then more or less spreading, 1.3-3.8 cm. long, rhachis angular, grooved, glabrous. Spikelets 3-4 mm. long, solitary, or rarely 2-nate, subsecund, ovoid, turgid, glabrous, white; pedicels short or long, with a cupular tip, scaberulous. Glumes 4, subcoriaceous, lower involucrel glume scarcely shorter than the upper, and about equalling the lower floral glume, broadly ovate, acute, concave, 5-7-nerved, upper involucrel glume broadly ovate, acute, 7-nerved, lower floral glume ovate, acuminate, 9-nerved, paleate, male, upper floral glume much smaller than the lower, ovate-oblong, acute, smooth, polished. Anthers purple. Styles short, stigmas short, pale purple.

Locality : *Sind* (Duthie *teste* Cooke), Sehwan, sand-hills (Bhide!).

Kathawar - Rajkot (Woodrow *teste* Cooke).

Ecology : Common on sand-hills of deserts. In pure sand it develops long spongy rootlets 3 mm. thick by means of which it can obtain sufficient moisture.

Distribution : Tropical Africa, Egypt, Cyprus, S. Palestine, Arabia, Socotra, S. Persia, Baluchistan, Sind, Gujarat.

Economic uses : In Egypt a kind of bread is made from the grain. An excellent fodder for camels.

Explanation of Plate 98 : *Panicum turgidum* Forak.

1. Spikelets.
2. Lower invol. glume
3. Upper invol. glume
4. Lower floral glume.
5. Palea of lower floral glume.
6. Stamens
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary, styles and lodicules.

2. PANICUM OBSCURANS Woodrow.

PLATE 99.

Panicum obscurans Woodr. in Journ. Bomb. Nat. Hist. Soc. XIII (1901) 434; Cooke Fl. Bomb. II (1908) 935.

Isachne obscurans Woodr. in Gard. Chron. 23, ser. 3 (1898) 161.

Vernacular name : Tan-sawa.

Etymology : *Obscurans* means something that darkens. What it alludes to we are not able to say.

Description : Annual; stems tufted, erect or ascending, 30-60 cm. (or more) high; nodes glabrous. Leaves 9-12.5 by 1 cm. at the widest part, lanceolate, acute, with a few scattered hairs above, hispid with bulbous-based hairs below; sheaths closely striate, hispid with short bulbous-based hairs, the margins naked; ligule a tuft of hairs.

Panicle large, 38 by 30 cm., pyramidal, lax, branches of the panicle widely spreading, laxly racemously or subpaniculately branched, each branchlet 1-3-flowered at the apex, naked below, rhachis angular, grooved, scaberulous on the angles. Spikelets distant, solitary, 4-5 mm. long, pedicellate, narrowly ovoid, acuminate. Glumes 4, the 3 lower strongly nerved with green nerves; lower involucrel glume 3 mm. long, ovate, acuminate, shorter than the upper, membranous, 5-nerved, the nerves scaberulous; upper involucrel glume 4 mm. long, ovate, acuminate, 7-nerved, lower floral glume rather less than 4 mm. long, ovate, acuminate, empty, paleate, the palea half as long as the glume, elliptic-oblong, hyaline, shortly 2-dentate; upper floral glume 2.5 mm. long, crustaceous, hard, smooth, concave, elliptic, obtuse with incurved margins, yellowish white, very faintly 5-7-nerved, the palea crustaceous, elliptic, obtuse, with incurved margins, as long as the glume.

Stapf says that the tropical African *Panicum hypothermiz* K. Schum. is very similar and perhaps identical with *P. obscurans*, but he adds that the blades of the latter are much wider, measuring up to 14 mm. and that the panicle "is perhaps on the whole more open with slightly larger spikelets" (In Fl. Trop. Afr. IX, 699.) These are scarcely differences to justify specific distinction, but as we have not seen the African plant, we do not venture to decide the point.

If the identity between the two species should be established, Woodrow's specific name, being of a later date by 4 years, will have to cede to *P. hypophrya*.

Locality : Deccan : Mangn Farm (Herb. Econ. Bot. Poona !); Jeur, near Sholapur (Woodrow).

Ecology : According to Woodrow the whole inflorescence breaks off and is driven about by the wind.

Distribution : Endemic.

Economic uses : The grain is used as a fast-day food and cooked like rice (Woodrow).

Explanation of Plate 99 : *Panicum obscurans* Woodr.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, grain and styles.

3. PANICUM TRYPPERON Schult.

Panicum trypperon Schult Mantiss. II (1824) 244; Hook. f. Fl. Brit. Ind. VII (1896) 47; Prain Beng. Fl. II 76; Cooke Fl. Bomb. II (1908) 936; Haines Bot. Bih. and Or. (1924) 995.

P. militare Wall. Cat. no. 8712 (partim) E.

P. mucronatum Heyne in Wall. Cat. no. 8717 (partim).

P. Neesianum Wight & Arn. ex Steud. Syn. Pl. Glum. (1855) 74.

P. Roxburghii Spreng. Syst. I (1825) 320, Kunth Enum. Pl. I (1838) 126; Steud. l. c. 98

P. tenellum Roxb. Fl. Ind. I (1832) 306; Duthie Grasses N. W. Ind. (1883) 7.

Stapf in Fl. Trop. Afr. IX, 712, has separated *P. porphyrrhizos* Steud. from *P. trypperon* Schult. as understood by Hook. f. Fl. Brit. Ind. l. c., and with it all the material covered by the following synonyms : *P. confine* Hochst. ex Steud. Syn. Pl. Glum. I, 72.—*P. jumentorum* A. Rich. Tent. Fl. Abyss. II, 373 (non Jacq.)—*P. trypperon*, therefore, does not occur in tropical Africa.

Vernacular name : Bhatu.

Etymology : *Trypperon* means delicate.

Description : Annual; stems 30-90 cm. high, tufted, erect, or geniculate below, stout or slender, leafy at the base; nodes glabrous; internodes 5-12.5 cm. long. Leaves 7.5-25 cm. by 3-6 mm, usually flat, thin, linear, acuminate, more or less hairy on both surfaces, margins often ciliate, base narrow, sheaths long, glabrous or hairy, the margins often ciliate towards the top, ligule short, fimbriate.

Panicle 10-25 cm. long, often as broad as long, effuse; rachis filiform, slightly scaberulous; branches up to 10 cm. long, capillary. Spikelets 2.5-3 mm. long, very distant, ovoid, acuminate, sometimes with a purple tinge, glabrous, pedicels long or short, filiform. Glumes 4; lower involucrel glume about $\frac{2}{3}$ as long as the lower floral glume, broadly ovate, acuminate, membranous, 5-nerved, upper involucrel glume slightly longer than the lower floral glume, ovate, acuminate, 7-9-nerved, lower floral glume similar but shorter, 7-nerved, empty, paleate the palea oblong, obtuse, 2-toothed at the apex, smaller than the glume, hyaline; upper floral glume elliptic, obtuse, dorsally convex, smooth, shining, yellowish white, coriaceous, faintly 5-nerved, the margin very slightly incurved, the palea elliptic, as long as the glume, coriaceous.

Locality : Gujarat : On the Idar Frontier, Prantij Taluka, sandy waste (Sedgwick !).

Konkan : Malabar Hill (Lushba teste Cooke).

Deccan : Poona (Woodrow teste Cooke), Jeur (Woodrow teste Cooke); Malhargad (Woodrow teste Cooke).

S. M. Country : Dharwar (Garade !), Dharwar, on pasture and dry hills (Sedgwick 6144 !).

Ecology : Grows on pasture land, borders of cultivated fields and on cultivated land.

Distribution : Punjab, Bengal, W. Peninsula, Ceylon, China, Borneo.

4. PANICUM PSILOPODIUM Trin.

Panicum psilopodium Trin. Gram. Panic. 217; Kunth Enum. Pl. I (1838) 100; Steud. Syn.

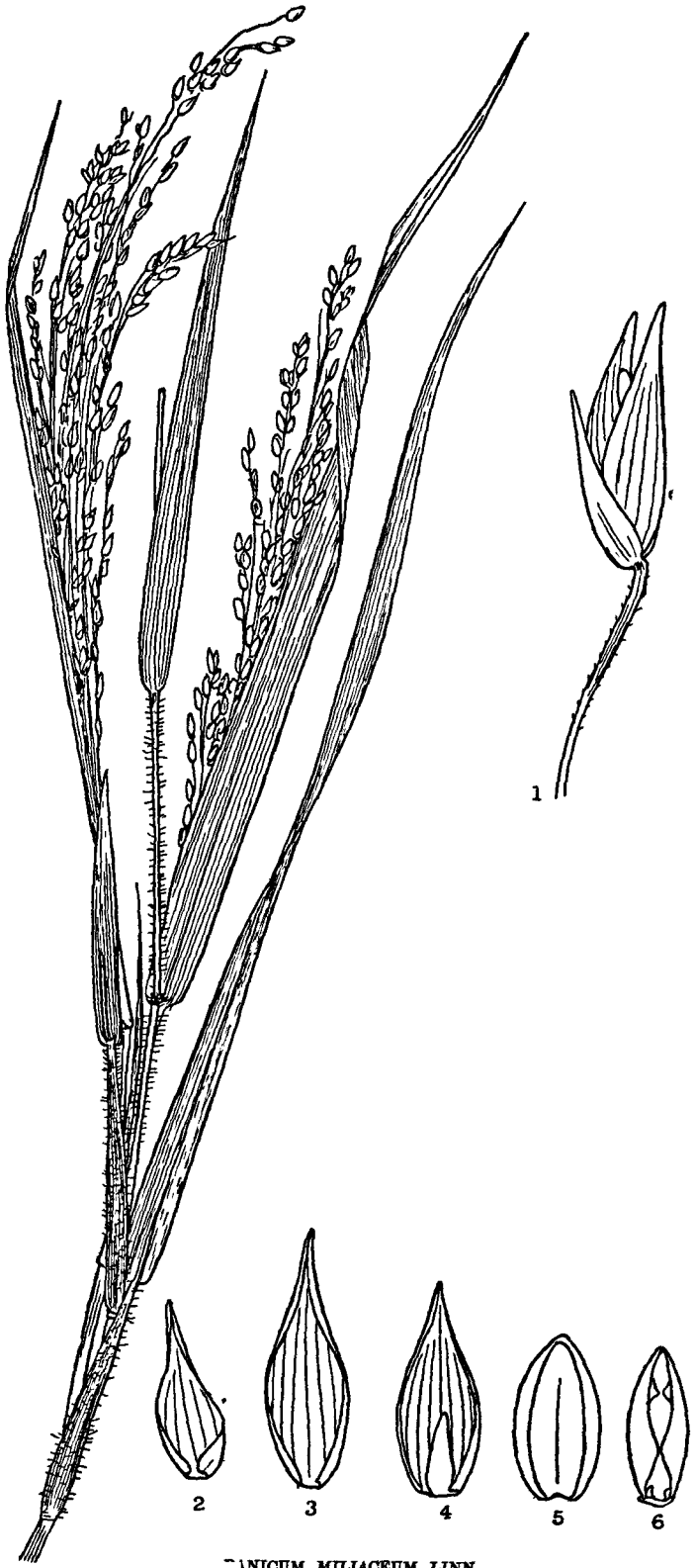
Pl. Glum. (1855) 83; Aitchis Cat. Panjab Pl. (1869) 161; Duthie Grasses N. W. Ind.

(1883) 6, Field and Gard. Crops I, t. 23, Fodder Grasses N. Ind. (1888) 10 (in nota); Hook.

f. Fl. Brit. Ind. VII (1896) 46; Saxton & Sedgwick Plants of N. Gujarat in Rec. Bot.

Surv. Ind. VI (1918) 312, Haines Bot. Bih. and Or. (1924) 993.

Vernacular name : Mordanura.



PANICUM MILIACEUM LINN.

Delin

Etymology : *Psilopodium* is derived from *psilos*, slight, slender, and *podium*, a foot-stalk or similar support, alluding to the very capillary branches of the panicle

Description : An annual, tufted grass. Culms erect or quickly ascending, 30-60 cm. high, rather slender, simple or branched, usually leafy up to the panicle. Leaves rather broadly linear, acute or somewhat acuminate, 7-30 cm. by 4-8 mm. glabrous or with few short spreading hairs towards the base, rarely thinly hairy all over. Sheaths often with spreading hairs which leave minute raised dots after falling, more usually glabrous, loose, striate. Ligule a narrow row of hairs.

Panicle spreading, 5-20 cm. long, with very capillary branches and slender pedicels which are often 10 mm. long. Spikelets 2-3 mm. long, geminate, narrowly elliptic, with abruptly acute tip. Lower involucrel glume very broadly ovate-acute, about $\frac{1}{2}$ the spikelet, base amplexicaul but not overlapping itself in front, 5-nerved. Upper involucrel glume oblong-ovate, as long as spikelet, minutely cuspidate, 9- (11-) nerved. Lower floral glume similar, with delicate, oblong, margined palea, upper narrow-ellipsoid, acute, very smooth and polished as is its palea.

Locality : Gujarat. Ahmedabad and elsewhere in shady wet places in the monsoon (Saxton & Sedgwick)

Distribution : India, Burma, Malacca, Ceylon.

*5. *PANICUM MILLACEUM* Linn.

PLATE 100.

Panicum milaceum Linn. Sp. Pl. (1753) 58; Forsk. Fl. Aegypt-Arab (1775) CIV, Host. Gram. Austr. II, 16, t. 20, Kunth Enum. I (1838) 104, Suppl. 81, Trin. Pan. Gen. 194, Sp. Gram. Ic. t. 221; Reichb. Ic. Fl. Germ. VII, t. 82; Steud. Syn. Pl. Glum. I (1855) 77, Duthie Grasses N. W. Ind. (1883) 5, Field and Gard. Crops. t. 23, Fodder Grasses N. Ind. (1888) 9; Hook. f. Fl. Brit. Ind. VII (1896) 45; Watt Dict. Econ. Prod. Ind. VI, 12; Cooke Fl. Bomb. II (1908) 939; Stapf in Fl. Trop. Afr. IX, 696.

P. aspernum Fisch. Cat. Hort. Govenk. ex Jacq. Eclog. Gram. 46, t. 31; Nees Agrost. Bras. 199.

P. Milium Pers. Syn. I (1805) 83.

Milium esculentum Moench Meth. 203

M. Panicum Mill. Gard. Dict. ed. VIII, no. 1.

Vernacular names : Common Millet, Proso Millet, Broom-Corn, Hog-Millet, Cheno, Vari, Gajro, Sava, Chinese, Varagu, Chirwa, Bansu, Phikar, Rali.

Etymology : *Milaceum* is derived from the old Latin *milium*, millet

Description : A tufted annual, 0.6-1.2 m. high. Stems erect or geniculate ascending, terete, stout or slender, 4-5-noded, simple or sparingly branched, more or less softly hirsute below the nodes, the uppermost internode usually quite glabrous. Leaf-blades linear from an equally wide or slightly contracted and rounded base, long-tapering to a slender point, 15 to over 30 cm. by 6-20 mm., flat, flexuous, usually glabrous except for the often ciliate lower margins and hispidulous dorsal midrib, rarely sparsely hairy all over, hairs long and fine, midrib somewhat stout and prominent below in large leaves, primary lateral nerves 3-6 on each side, very slender. Sheaths terete, somewhat loose or the upper tight, closely striate, spreadingly hirsute with tubercle-based hairs, pubescent or loosely bearded at the nodes, longer or slightly shorter than the internodes. Ligule a narrow ciliate rim.

Panicles contracted and rather dense or open, narrowly oblong, nodding, often with their base permanently enclosed in the uppermost sheath or only shortly exerted, up to 30 cm. long, in spontaneous specimens usually scantier, looser and at length more open, divided up to the fourth or in cultivated specimens the fifth degree, all the divisions filiform, angular and scabrid; primary axis slender or somewhat stout below, subterete, striate or grooved and smooth towards the base; primary branches more or less approximate below, more distant upwards, often much divided from low down; branchlets relatively long, the lower divided again in the same manner or like the remainder from much higher up with spikelets in small loose racemes of 2 (rarely 3) towards the summit; pedicels hardly thickened upwards, with truncate tips, the lateral from less than 2-6 mm. long. Spikelets ovate-oblong to ovate-lanceolate, apiculate-acuminate, turgid, 4.5-5 mm. long, glabrous, green or brownish green. Involucrel glumes persistent, unequal, strongly and prominently nerved; lower broad-ovate, acute, from $\frac{1}{4}$ - $\frac{1}{2}$ the length of the lower floret, 5-nerved, upper corresponding in size and outline to the spikelet, broadly rounded on the back, 11-nerved, tip contracted, apiculate to shortly rostrate. Lower floral glume barren, very like the lower involucrel glume, palea ovate to ovate-oblong, truncate or emarginate, up to about $\frac{1}{2}$ the length of the glume. Upper floret hermaphrodite, elliptic-oblong in outline, subacute, very convex on the back, up to over 3 by 2 mm.,

variously coloured (white, yellow, red, brown or black), very smooth and polished, glume and palea crustaceous. Grain white.

Locality : Cultivated in many parts of the Presidency, chiefly in Gujarat and on the Ghats.

Ecology : This Kharif crop depends on the natural rainfall, and is never irrigated.

Distribution : India, Africa and other hot countries.

Economic uses : This millet produces food grain for the poor, but is also used by the middle and richer classes on fast days. In the green state this millet affords excellent fodder for cattle and horses. The straw is not used for fodder.

Explanation of Plate 100: *Panicum miliaceum* Linn.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume
4. Lower floral glume and palea.
5. Upper floral glume.
6. Palea and grain.

***6. PANICUM MILIARE Lam.**

PLATE 101.

Panicum miliare Lamk. Ill. Gen. I (1791) 173, Roxb. Fl. Ind. I (1832) 309; Kunth Enum. Pl. I (1838) 104; Aitchis. Cat. Panjab Pl. (1869) 159, Duthie Grasses N. W. Ind. (1883) 5, Field and Gard. Crops 7, t. 26, Indig. Fodder Grasses (1886) t. 46, Fodder Grasses N. Ind. (1888) 10, Hook. f. Fl. Brit. Ind. VII (1896) 46; Cooke Fl. Bomb. II (1908) 939 (partim); Haines Bot. Bih. and Or (1924) 993.

P. attenuatum Willd. Enum. Hort. Berol. 1033.

P. Memeri Koen. ex Nees in Neue Schrift. Ges. Naturf. Fr. IV (1803) 83.

P. simplex Rottl. ex Trin. Gram. Panic. 216.

P. sumatrense Roth Nov. Sp. (1821) 50.

Vernacular names : Little Millet, Poi, Bagad, Badi, Kult, Burburi, Vanghudi, Halvari, Sava, Vari, Gado, Kuri, Save, Baragu.

Etymology : *Mihare*, see previous species.

Description : An annual grass. Culms 30-90 cm. high, rather slender, erect or base geniculate, simple or branched, usually leafy up to the panicle. Leaves linear 15-60 cm. by 12-25 mm., gradually tapering from a broad base, glabrous or finely hairy, sheaths glabrous, rarely hirsute with tubercle-based hairs.

Panicles very compound, contracted or thyrsiform, and often nodding, 10-25 cm. long (without the subsidiary axillary panicles which are often developed). Spikelets glabrous, rather flattened, suddenly acute or slightly cuspidate 2-3.2 mm. long, mostly paired on unequal pedicels, but often solitary at the ends of the branchlets, lanceolate in flower, elliptic or broadly elliptic in fruit. Lower involucre glume very broadly ovate, subtruncate, then suddenly acute, or scarcely acute, about $\frac{1}{2}$ the spikelet, white, membranous, 3-5-nerved, nerves arching and anastomosing. Upper involucre glume herbaceous, ovate-lanceolate, 11-13-nerved. Lower floral glume 9-nerved, neuter, palea as long as its glume. Upper floral glume narrow-elliptic or elliptic-oblong to broadly ovate, acute, shining, white or pale brown, or dark brown, often 3-5-streaked dorsally.

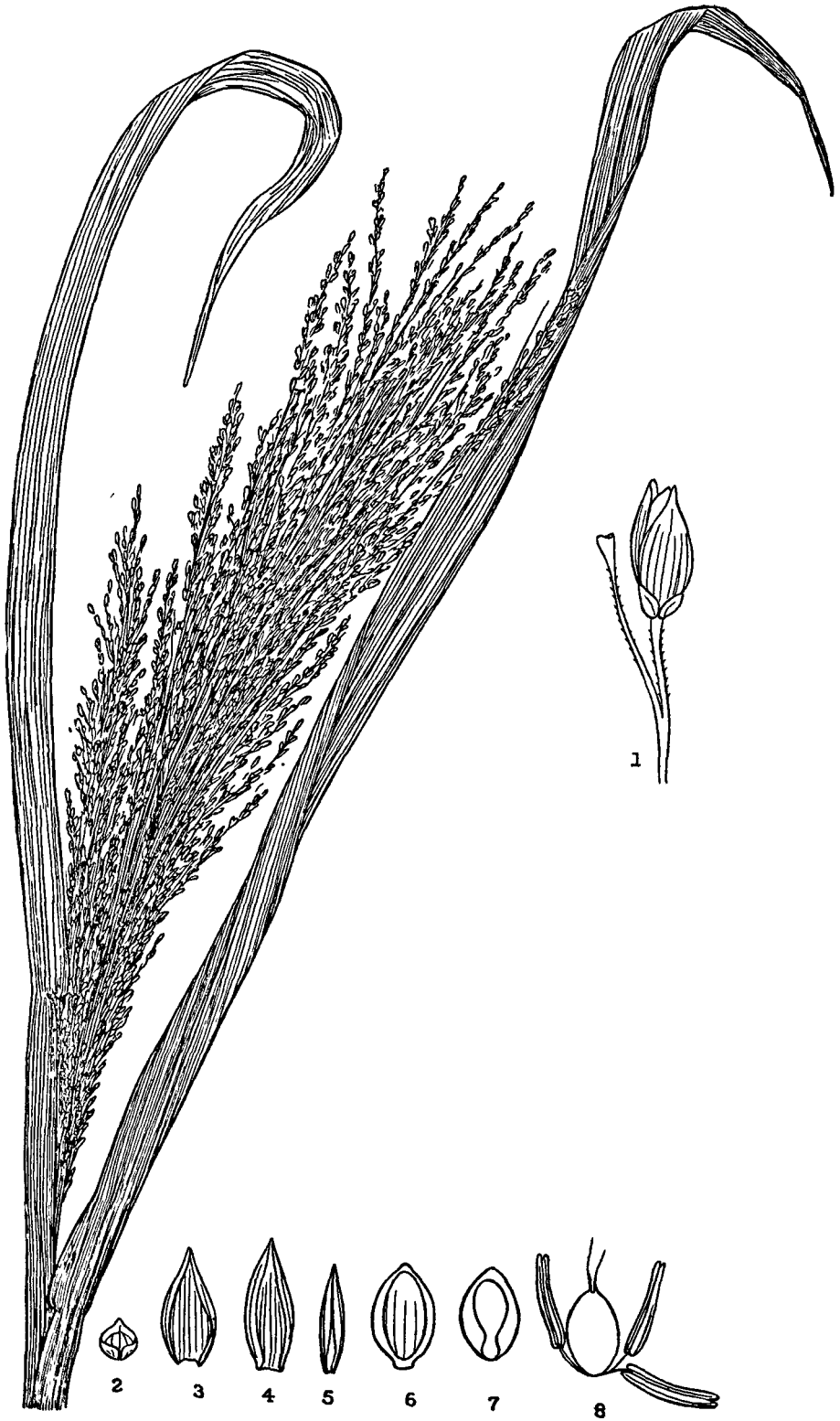
NOTE.—*P. miliare* is in all probability a cultivated form of *P. polypodum*. It is not always easy to distinguish between the two. Hooker already felt this difficulty. "If I remember aright," he says, "*P. miliare* was conjectured by Munro to be a cultivated form of *P. polypodum*; and except in the greater size, more contracted panicle, rather larger spikelets and usually shorter pedicels of *P. miliare* I fail to find characters whereby to separate them, and these are not very reliable. In its common state the grain of *miliare* is broader than in any form of *polypodum* and much darker coloured." (F. B. I. VII, 46). Duthie was unable to distinguish *P. miliare* from *P. polypodum* (Fodder Grasses N. W. Ind. 10). Stapf, however, is inclined to think that they are separable. In his opinion the true *P. polypodum* has nearly glabrous leaves, smaller spikelets and a shorter lower involucre glume. Prun in his Bengal Plants gives as the characters of *P. miliare*: "Leaves hairy; cultivated," and of *P. polypodum*: "Leaves glabrous, wild." But he has nevertheless, as Haines points out, "named most of the glabrous-leaved forms in the Calcutta Herb. as *miliare*, and I have myself noticed whole crops with glabrous leaves, whereas I have collected *polypodum* with hairy leaves."

The same author, after discussing the various statements, sums up his own observations: "Although absolutely the leaves of *miliare* are often broader than in *polypodum*, yet they are relatively narrower and much more alternate. Moreover the cultivated *miliare* and its feral forms always appear to have more or less contracted panicles in contrast to the shorter, always quickly effuse, panicle of *polypodum*. The grain of *miliare* is, as would be expected, rather larger being .08-1.9" long as compared with .07" long in *polypodum*."

Locality : Cultivated occasionally in some parts of the Presidency.

Ecology : This grass is satisfied with very poor soil; usually sown at the commencement of the rainy season and ripens in 3 months.

Distribution : Cultivated or naturalized throughout India and Ceylon. Cultivated in the tropics.



PANICUM MILIARE LAMK.

Drawn: R. K. Bhude.



PANICUM SUBEGLUME TRIN.

Delin: B. K. Bhida

Economic uses : The grain is of an inferior kind and mostly eaten by the poorer classes of people. Cattle are very fond of the straw, but reckoned inferior to that of rice

Explanation of Plate 101 : *Panicum mahars* Lamk

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume
7. Palea of upper floral glume.
8. Stamens and grain.

7. PANICUM SUBEGLUME Trin.

PLATE 102.

Panicum subeglume Trin. in Mém. Acad. Pétersb. sér. 6, III, pt. 2 (1835) 292; Steud. Syn. Pl.

Glum. (1855) 82; Hook. f. Fl. Brit. Ind. VII (1896) 51; Cooke Fl. Bomb. II (1908) 936.

P. arcuatum Br. ex Nees in Wight Cat. no. 1639 (non Br. Prodr.).

P. Brownianum Wight & Arn. ex Steud. l. c. 98.

P. Torreyanum Wight & Arn. ex Steud. Nom. ed. 2, II, 264.

Milium capillare Roth Nov. Sp. (1821) 39; Kunth Enum. Pl. I (1838) 67.

M. tomentosum Koen. ex Rottl. in Ges. Naturf. Fr. Neue Schr. IV (1803) 220, Steud. Syn. Pl. Glum. (1855) 34; Kunth l. c. 66.

Etymology : *Subeglume* means almost glumeless, alluding to the absence of the involucreal glumes.

Description : Perennial, stem slender, 30-60 cm. long, glabrous or nearly so; nodes glabrous or tomentose. Leaves 7.5-15 cm. by 5-10 mm., linear, finely acuminate, glabrous or softly hairy, sheaths glabrous or softly hairy, ligule short, membranous.

Panicle large, effuse, 7.5-18 cm. long, spreading, rhachis capillary; branches capillary, reaching 10 cm. long, the lower suberect, alternate, often branched from the base; branchlets filiform. Spikelets pedicellate, 2.5 mm. long, oblong-ellipsoid, tapering to both ends, dorsally compressed, glabrous or silky. Involucreal glumes very minute, hyaline, sometimes one (rarely both) obsolete; lower floral glume 5-7-nerved, elliptic-oblong, subacute, glabrous or silky; upper floral glume as long as the lower, elliptic-oblong, acute, with membranous inflexed margins; palea oblong, subacute, slightly shorter than its glume, with membranous inflexed margins.

Locality : *S. M. Country :* Badami (Woodrow teste Cooke; Bhide!).

Distribution : W. Peninsula.

Explanation of Plate 102 : *Panicum subeglume* Trin.

1. Spikelet.
2. Lower floral glume.
3. Upper floral glume.
4. Palea of upper floral glume.
5. Stamens, ovary and styles.

*8. PANICUM MAXIMUM Jacq.

PLATE 103.

Panicum maximum Jacq. Ic. I, 2, t. 13; Collect. I, 76; Trin. Pan. Gen. 180, and in Mém.

Acad. Pétersb. 6, sér. III, 268; Nees Fl. Afr. Austr. (1841) 36; Steud. Syn. Pl. Glum.

I (1855) 72; Griseb. Fl. Brit. West Ind. (1864) 549; Doell in Mart. Fl. Bras. II, II, 202;

Archie. Cat. Panjab Pl. (1869) 159; Baker Fl. Mauriti. (1877) 436; Boiss. Fl. Or. V (1884)

439; Hook. f. Fl. Brit. Ind. VII (1896) 49; Trin. Fl. Ceyl. V, 153; Stapf in Dyer Fl.

Cap. VII, 404; Cooke Fl. Bomb. II (1908) 939; Haines Bot. Bih. and Or. (1924) 995;

Stapf in Fl. Trop. Afr. IX (1920) 655.

P. maximum var. *hirsutissimum* Oliv. in Trans. Linn. Soc. XXIX, Bot. 171.

P. maximum var. *obtusissimum* Stapf in Cheval. Sudania 161, 163.

P. polygamum Sw. Prodr. Ind. Occ. 24.

P. laeve Lam. Ill. I, 172.

P. jumentorum Pers. Syn. I (1805) 83; H. B. & K. Nov. Gen. & Sp. I, 104; Duthie Grasses N. W. Ind. (1883) 5, Fodder Grasses N. Ind. (1888) 9.

P. altissimum Brouss. Elench. Hort. Monsp. (1805), 42 (non Meyer); Dalz. & Gibb. Bomb. Fl. Suppl. (1861) 98.

P. trichocondylum Steud. Syn. Pl. Glum. I (1855) 74.

P. pamplemoussense Steud. l. c. 71.

P. hirsutissimum Steud. l. c. 72.

P. giganteum Mez in Engl. Jahrb. XXIV, 143.

Vernacular name : Guinea Grass.

Etymology : *Maximum* means the tallest.

Description : A perennial, densely tufted grass, up to 3 m. high. Culms erect or geniculate-suberect, usually stout, 3-4-noded, simple or sparingly branched with the branches erect, terete or compressed below, usually quite glabrous and smooth, more rarely more or less hirsute and rough from the tubercular hair-bases. Leaves glabrous or more or less softly hairy or coarsely hirsute with tubercle-based hairs. Sheaths rather firm, the lower compressed, the others terete and tight, often bearded at the mouth and usually so at the nodes, rarely the nodes quite glabrous. Ligule membranous, very short, ciliate, usually with dense hairs from behind it. Blades linear from an equally wide or very gradually narrowed and shortly contracted base, long-tapering to a fine point, 10-60 cm. by 4-18 or even 25 mm., flat, margins scaberrulous to spinulosely scabrid, midrib prominent below, whitish and shallowly channelled above, primary nerves up to 9 on each side.

Panicle erect or nodding, contracted or open, from 10 to over 45 cm. long, glabrous or more often villosulous at the lower nodes and motile branch bases, divided to the 4th or 5th degree, all the divisions filiform to capillary, often more or less wavy, angular and scabrid or the larger smooth downwards, primary axis comparatively slender, smooth, terete and often fluted below, scaberrulous upwards, lower primary branches whorled, suberect or spreading, up to 30 cm. long, mostly remotely divided from 2.5-7.5 cm. above the base, their lower branchlets often up to 7.5 cm. long, flexuous and remotely divided or like the rest rather short and contracted, penultimate divisions usually closely 2-3-spiculate with the lateral pedicels shorter than the clustered spikelets, more rarely loose to very loose with the pedicels several times longer, all the pedicels very fine with small subcupular tips. Spikelets oblong, subobtusate to acute, somewhat turgid, broadly rounded on the back, 3-4.5 or sometimes 4 mm. long, light green or tinged with purple, glabrous or rarely more or less densely pubescent. Involucral glumes dissimilar, faintly nerved. Lower rounded or shortly acute or minutely apiculate, about $\frac{1}{4}$ to $\frac{1}{2}$ the length of the spikelet, hyaline, 3-1-nerved or almost nerveless. Upper corresponding in shape and size to the spikelet, membranous, 5-nerved. Lower floral glume male, like the upper involucral glume, 7-nerved, palea slightly shorter, oblong, obtuse. Upper floret hermaphrodite, oblong, shortly acute, up to almost 3 mm. long, whitish, glume and palea thinly crustaceous, finely transversely rugose except on the flexures. Anthers 1-1.5 mm. long. Grain over 1 mm. long.

Locality : Widely cultivated, chiefly in Gujarat and Sind.

Distribution : Indigenous in tropical and S. Africa, Madagascar, the Mascarenes and in Yemen. Introduced into India and America.

Economic uses : An excellent fodder grass.

Explanation of Plate 103 : *Panicum maximum* Jacq.

1. Spikelet.
2. Lower invol. glume
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Stamens.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary and styles.

9. *PANICUM PALUDOSUM* Roxb.

Panicum paludosum Roxb. Fl. Ind. I (1832) 307 (non Nees); Wall. Cat. no. 8711; Griff. Notul. 37, Ic. Pl. Asiatic. t. 139. f. 127; Duthie Fodder Grasses N. Ind. (1888) 11.

P. proliferum Hook. f. Fl. Brit. Ind. VII (1896) 60 (non Lam.).

P. proliferum var. *paludosum* Cooke Fl. Bomb. II (1908) 937 (non Stapf).

P. proliferum Haines in Bot. Beech. and Ox. (1924) 995 (non Lam.).

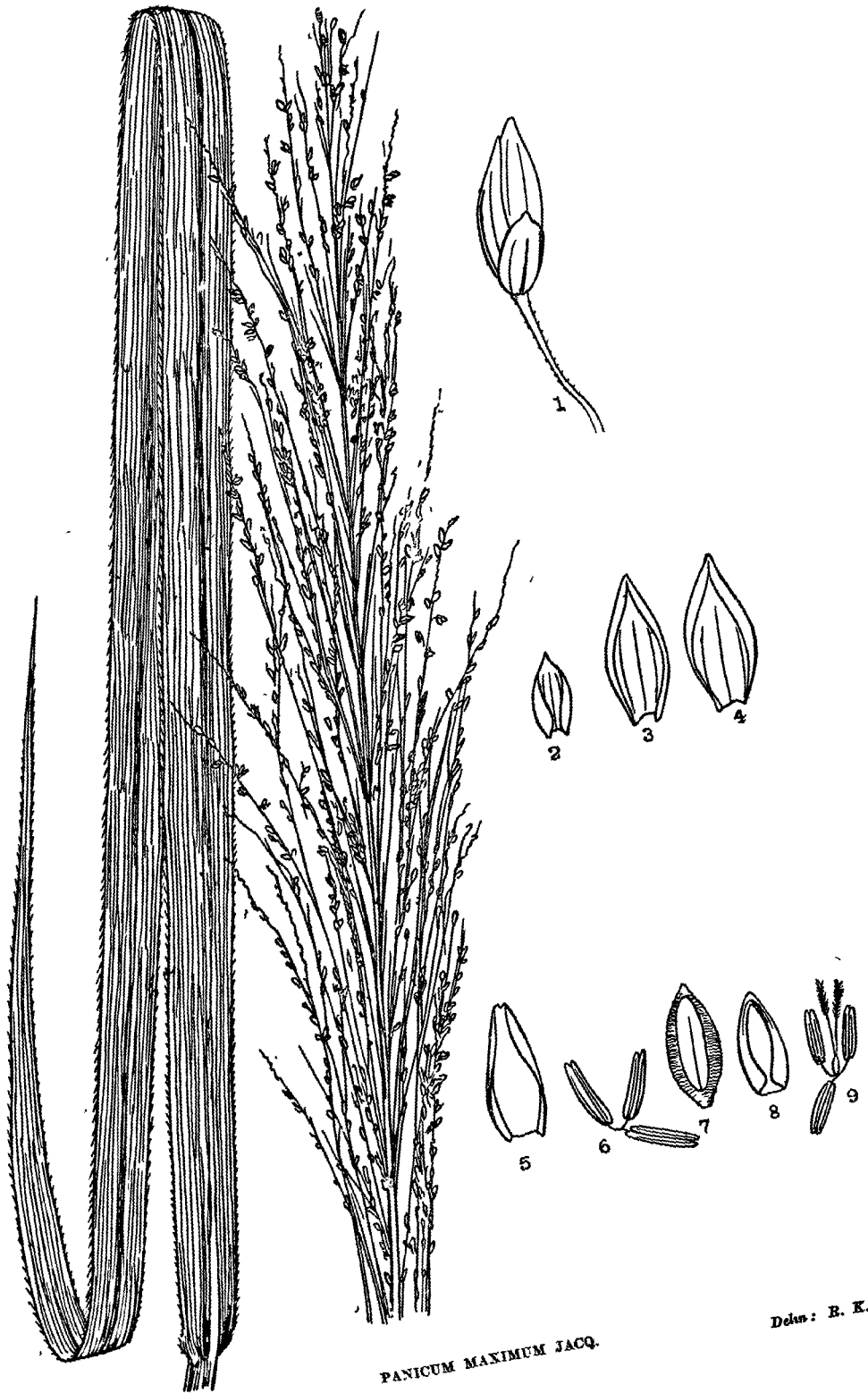
P. proliferum Prain in Beng. Plants 1176 (non Lam.).

P. decompositum var. *paludosum* Trin. Cat. Ceyl. Pl. 105.

Vernacular names : Berati, Kulus-naa.

Etymology : *Paludosum* is derived from *paludo*, pond, i.e., inhabiting ponds.

Description : Perennial; stem simple or branched, 60-90 cm. high, leafy, ascending from a creeping or floating spongy rootstock which is sometimes as thick as the little finger.



PANICUM MAXIMUM JACQ.

Des: R. K. Bh.



PANICUM ANTIDOTALE RETZ.

Desn: E. K. B.

Leaves 15-30 cm. by 6-17 mm., linear or ensiform, acute or acuminate, flat, subcoriaceous, glabrous, base broad, subcordate; sheaths loose, glabrous, the margins naked; ligule a ridge of fine hairs.

Panicle 10-25 cm. long, often as broad as long when spreading, sessile at the mouth of the leaf-sheath or very shortly pedunculate; lower branches whorled and fascicled, rhachis stout, angular, scaberulous; branches of the panicle strict, naked below, bearing short erect flowering branchlets about the middle. Spikelets 3-4 mm. long, narrowly ovoid-lanceolate, acuminate, greenish, solitary or 2-nate, pedicels angular, scaberulous. Glumes 4; lower involucre glume not $\frac{1}{2}$ the length of the upper, orbicular or reniform, not nerved, hyaline; upper involucre glume ovate, acuminate, 7-nerved, as long as the lower floral glume, lower floral glume similar, 9-nerved, paleate or not, empty (rarely male); upper floral glume shorter than the lower, oblong, acute, yellowish white, smooth, shining, with incurved margins; palea as long as the glume, oblong, acute.

Locality: *Konkan*. Byculla (McCann A140 !), Sewri (McCann 3641 !); *Salsette* (Lisboa teste Cooke).

W. Ghats Khandala (McCann 5310 !), Lonavla (Lisboa teste Cooke).

Deccan: Poona (Lisboa teste Cooke).

S. M. Country: Devarayi (Sedgwick 4118 !).

N. Kanara: Gersoppa Falls, on rocks in river-bed, common (Hallberg & McCann A139 !), Karwar (Hallberg & McCann A124 !).

Ecology: A subgregarious species. 'Grows in marshy places, still waters, banks of rivers and tanks. Sometimes it is partially submerged in water.'

Distribution: India, Ceylon. (It certainly does not occur in tropical and S. Africa, but whether it extends eastwards beyond India we are not able to say.)

10. PANICUM ANTIDOTALE Retz.

PLATE 104.

Panicum antidotale Retz. Obs. IV (1786) 17, Duthie Grasses N.W. Ind. (1863) 2, Indig. Fodder Grasses (1886) t. 3, Fodder Grasses N. Ind. (1888) 4; Boms. Fl. Or. V (1884) 440; Lisboa Bomb. Grasses (1896) 23; Hook. f. Fl. Brit. Ind. VII (1896) 52, Cooke Fl. Bomb. II (1908) 937.

P. maximum Wall. Cat. no. 8715 B (*partim*) C (*partim*).

P. prunosum Bernh. ex Trin. Pan. Gen. 191.

P. subulidum Kunth Rev. Gram. II (1829) 397, t. 112; Enum. Pl. I (1838) 101.

Vernacular names: Git, Sera, Male, Shansukha, Gharam, Ghamar, Girni, Mangwar, Barn, Barwari, Barigagh.

Etymology: *Antidotale*, something that works as an antidote.

Description: A tall glabrous perennial grass reaching 1.5 m. high, rootstock creeping, stoloniferous, stem solid, woody, terete, smooth; nodes thickened, the lower sometimes rooting. Leaves 15-60 cm. by 6-20 mm., linear, very finely acuminate with capillary tips; sheaths long, glabrous, striate, with naked margins, ligule short, membranous, jagged or fimbriate.

Panicle 15-23 cm. long, effuse, pyramidal; rhachis very slender, angular, glabrous or slightly scaberulous; branches usually fascicled (the upper sometimes solitary), 7.5-10 cm. long, filiform, spreading and drooping; branchlets capillary. Spikelets laxly crowded on the branchlets, reaching 3 mm. long or slightly longer, ovoid, acute, glabrous. Glumes 4, lower involucre glume half as long as the upper, broadly ovate, subobtusely, 3-nerved, hyaline; upper involucre glume broadly ovate, acuminate, 7-9-nerved, membranous; lower floral glume equal and similar to the upper involucre glume, paleate, empty or male, the palea oblong, subacute, hyaline, as long as the glume; upper floral glume coriaceous, elliptic, obtuse, with incurved margins, dorsally smooth, yellowish white, palea thinly coriaceous, ovate, acute, as long as the glume. Anthers linear-oblong. Styles 2, distinct, conspicuous, very plumose.

Locality: *Sind*: (Stocks 659 teste Cooke), Karachi to Landi (Burns !), Laki (Bhide !); Sukkur (Woodrow teste Cooke); Clifton, near Karachi (Sabnis B797); Umarkot, sand dunes (Sabnis B1080 !); Mirpurkhas (Bhide !), in fallow fields (Sabnis B1208 !); Jamesabad, in fields (Sabnis B1154 !); Sanghar (Sabnis B769 !), Gharo (Blatter & McCann D606 ! D608 !).

Cutch: Sumrasar (Blatter 3760 !); Bhuj, Rhodi Maka (Blatter 3751 !).

Kathnagar (Woodrow teste Cooke).

W. Ghats: Londa (Woodrow teste Cooke).

S. M. Country: Dharwar (Garade !).

Ecology : This grass usually grows in clumps or in the shelter of bushes and hedges.

Distribution : Arabia, Afghanistan, Punjab, Upper Gangetic Plain, W. Peninsula, Ceylon, Australia.

Economic uses : On the utility of this grass opinions widely differ

Medicinal uses : According to Stewart the smoke of the burning grass is used for fumi-gating wounds and also as a disinfectant in small-pox. It is also employed in throat affections. Here is the explanation of the specific name *antidotale*.

Explanation of Plate 104 : *Panicum antidotale* Retz.

1. Spikelets.
2. Ligule.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Palea of lower floral glume and stamens.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary and styles.

11. PANICUM MONTANUM Roxb.

PLATE 105.

Panicum montanum Roxb. Fl. Ind. I (1832) 313 (*excl. descr. gluma sup. floralis*); Kunth Enum. Pl. (1838) 126; Benth. Fl. Hongk. (1861) 412; Hook. f. Fl. Brit. Ind. VII (1896) 53; Cooke Fl. Bomb. II (1908) 938; Haines Bot. Bih. and Or. (1924) 996.

P. courtallense Nees & Arn. ex Wight Cat. no. 2342, Steud. Syn. Pl. Glum. (1855) 83.

P. euchroum Steud. l. c. 98.

Vernacular names : Salket, Tokarband.

Etymology : *Montanum* is derived from *mons*, mountain.

Description : Perennial; stem 0.9-1.2 m. high (or more), erect from a woody rootstock, stiff, hard, solid, smooth, sparingly branched; nodes glabrous, the lower emitting long filiform roots. Leaves 12.5-18 by 1.3-2.5 cm., spreading or deflexed from the sheath, linear-oblong, acuminate, flat, smooth, many-veined, glabrous or ciliate near the base only, with slender midrib and scaberulous margins, base broad, deeply cordate; sheaths shorter than the internodes, glabrous or pubescent, the margins naked or ciliate near the top; ligule of soft long hairs.

Panicle 20-38 cm. long, effuse, copiously branched, branches suberect or spreading, the lower branches very long; rachis of panicle and the branches more or less scaberulous. Spikelets 2.5-3 mm. long, ellipsoid, obtuse, solitary, distant; pedicels long, capillary, erect. Glumes 4; lower involucrel glume about half as long as the spikelet (or more), ovate, subacute, 3-5-nerved, with ciliate margins; upper involucrel glume broadly ovate, obtuse, 5-nerved, sometimes with ciliate margins, subcoriaceous; lower floral glume slightly longer than the upper involucrel glume, broadly ovate, obtuse, 5-nerved, epaleate, subcoriaceous; upper floral glume elliptic, subacute, faintly striolate, coriaceous or almost crustaceous; palea nearly as long as the glume, elliptic, subacute, coriaceous, with inflexed membranous margins.

Locality : *Konkan* : Pen, hills (Bhide !); Kanari Caves (McCann A134! A136!).

W. Ghats : Khandala (McCann A136!); Lonavla (Garade!), Castle Rock, on hill behind station (Bhide!).

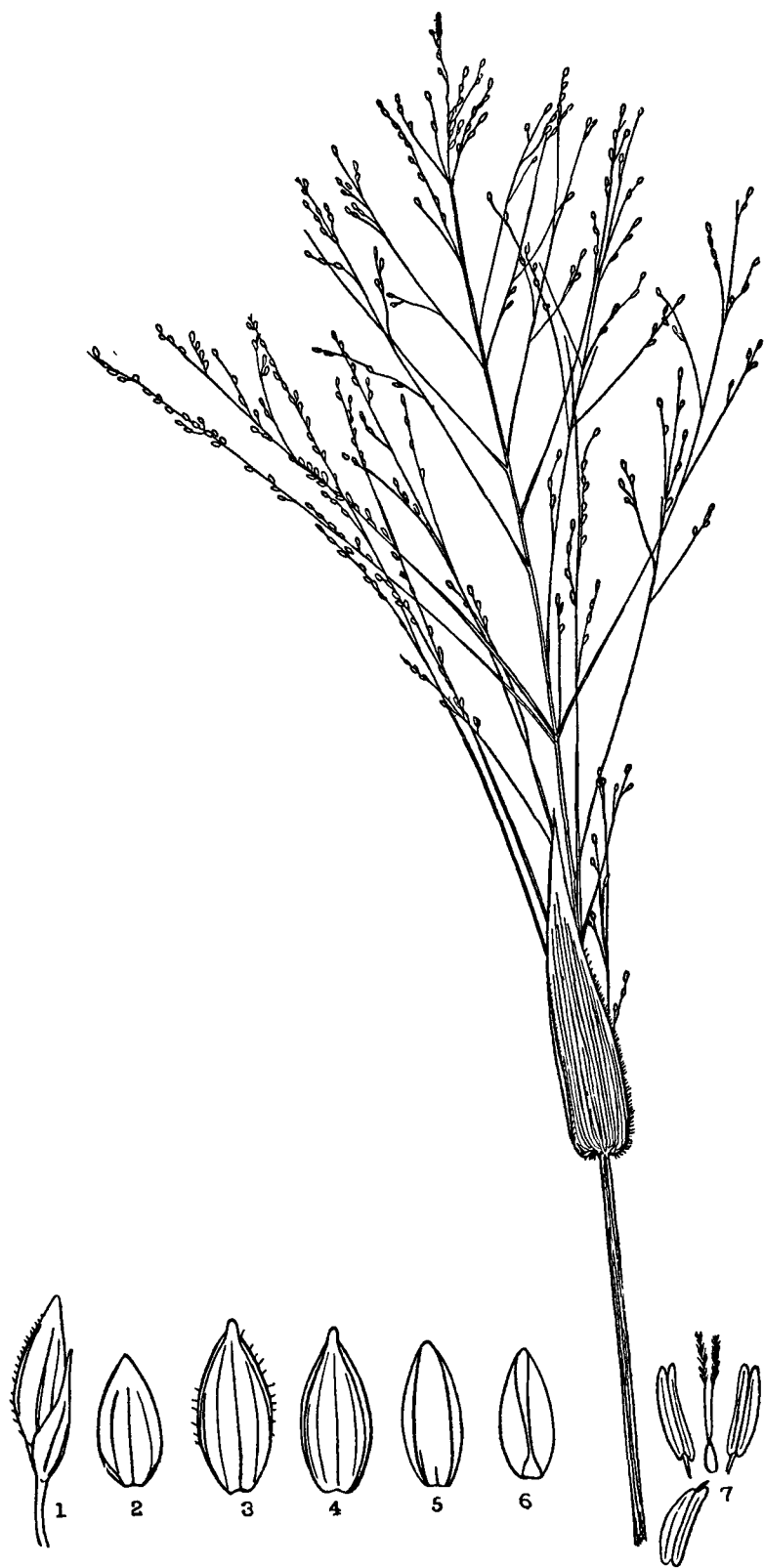
Deccan : Lohagad, half way up (McCann A137!).

N. Kanara : Dandeli (Talbot 2243!); Kala Nuddi (Herb. Econ. Bot. Poona!); Karwar, hillside in shade of trees (Hallberg & McCann A135!, Talbot!); Sampkhand (Hallberg & McCann 9935!).

Distribution : Hotter hilly parts of India, Ceylon, Penang, Malaya, China, Philippines.

Explanation of Plate 105 : *Panicum montanum* Roxb.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.



PANICUM MONTANUM ROXB.

Detn: B. K. Bhida.



PANICUM AURITUM PRESL.

Delin: R. K. Bird

12. *Panicum auritum* Presl.

PLATE 106.

Panicum auritum Presl ex Nees Agrost. Bras. 176, Rel. Haenk. I (1830) 305; Trin. Pan. Gen. 176; Kunth Enum. Pl. I (1838) 113, Steud. Syn. Pl. Glum. (1855) 70; Baker Fl. Maurit. (1877) 437; Miq. Fl. Ind. Bat. III, 456; Hook f. Fl. Brit. Ind. VII (1896) 40, Haines Bot. Bih. and Or. (1924) 996.

P. insulicola Steud. l. c. 78.

P. javanum Nees & Buhse in Miq. Pl. Jungh. 376, Miq. Fl. Ind. Bat. l. c. 453.

P. patens Bojer Hort. Mauriti. ex Baker l. c.

Etymology : *Auritum* means having long or large ears, alluding in all probability to the broadly cordate leaves.

Description : A perennial, tall, erect grass. Culm 0.9-1.6 m. high, soft. Leaves linear-lanceolate, broadly cordate at base, 20-35 cm. by 24-30 mm., glabrous or sparsely hairy beneath. Sheath glabrous or sparsely hairy with villous mouth. Ligule very short.

Panicle long contracted or more or less effuse, 20-45 cm. long, fastigately branched, branches erect, 5-12 cm. long, branchlets and fascicles of spikelets subsecund. Spikelets green, glabrous, 1.7-2.5 mm, sessile or shortly pedicelled, strongly nerved, subacute. Lower involucre glume broadly ovate, $\frac{3}{4}$ - $\frac{1}{2}$ the length of the lower floral, obtuse or acute, nerves 3-5 arching, upper involucre and lower floral subequal, ovate-oblong, acute or acuminate, 5-nerved, palea of lower floral glume small, neuter. Upper floral glume as long as the lower lanceolate-acuminate, smooth, white, thinly coriaceous.

Locality : *W. Ghats* : Castle Rock (Gammie 15717 !).

Distribution : India, Ceylon, Malay Peninsula, Malaya, China.

Explanation of Plate 106 : *Panicum auritum* Presl.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume and palea.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary, styles and lodicules.

55. *Sacciolepis* Nash.

Annual or oftener perennial grasses. Leaf-blades linear and flat or filiform-convolute, or filiform-subulate.

False spikes often very dense, dark or variegated. Spikelets mostly very small, oblong to ovate-oblong or elliptic or lanceolate, subterete or laterally compressed, usually somewhat turgid, falling entire from the short finely filiform pedicels of a spikeform, very rarely open panicle. Involucral glumes similar in structure but unequal. Lower much shorter, softly or rigidly membranous, with a narrow hyaline margin or hyaline tip, stiffened by the hardening of the prominent and often rib-like nerves, or more or less dissimilar owing to the reduction of the lower glume to a small hyaline scale, or its differentiation into a narrow, hardened obscurely nerved back and broad hyaline margins. Upper with a curved or basally gibbous or saecate back, always much concave, mostly 7- or 9-, rarely 5- or up to 13-nerved. Lower floral glume male or barren, very dissimilar to the upper involucre glume and of the same or almost the same length, but with a straighter back, palea narrow, hyaline, finely 2-keeled, shorter than the glume, sometimes reduced or quite rudimentary. Upper floral glume hermaphrodite, oblong in outline seen from the back, very convex, chartaceous, ultimately subcrustaceous, with firm narrowly involute margins, obscurely 5-nerved; palea almost the length of the glume, tightly embraced by it all along and of the same texture, 2-nerved, hardly keeled. Lodicules 2, small, broadly cuneate. Stamens 3. Styles distinct; stamens long, loosely plumose, exerted terminally or subterminally. Grain tightly enclosed by the glume and palea, elliptic in outline, dorsally compressed, with an almost flat back and convex face; hilum punctiform.

Species over 30.—Tropics of the whole world.

I Lower involucre glume 3-nerved.

1. Spikes 1.5 cm. long. Spikelets lanceolate-ovoid, hispid,
2-2.5 mm. 1. *S. indica*.
2. Spikes 5-23 cm. long. Spikelets ovoid, 1.3-2.1 mm.
long 2. *S. myosuroides*.

II. Lower involucre glume 5-nerved 3. *S. interrupta*.

1. *SACCOLEPIS INDICA* Chase.

Saccollepis indica Chase in Proc. Biol. Soc. Wash. XXI (1908) 8; Haines Bot. Bh. and Or. (1924) 990; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1928) 18.

Panicum indicum Linn. Mant. II, 184; Roxb. Fl. Ind. I (1832) 281; Hook. f. Fl. Brit. Ind. VII (1896) 41; Retz. Obs. III (1783) 9.

P. arcuatum R. Br. Prodr. (1810) 189, Griff. Notul. III, 39, 40, Ic. Pl. Asiat. t. 147, fig. 1;

Duthie Grasses N. W. Ind. (1883) 5, Fodder Grasses N. Ind. (1888) 9.

P. Johannaë et incurvum Herb. Linn. ex Munro in Journ. Linn. Soc. VI, 39.

P. microstachyum Lam. Ill. I, 170.

P. myosurus Rich. in Act. Soc. Hist. Nat. Par. I (1792) 106.

P. myurus Lam. Ill. I, 172.

P. phalaroides Roem. & Schult. Syst. II, 452.

Hymenachne indica Buhse ex Miq. Fl. Ind. Bat. III, 458.

Description: A slender grass, 15-60 cm. high. Leaves linear-acuminate, 5-13 cm. long, up to 4 mm. wide, glabrous or hirsute, base narrow; sheath not auricled.

Panicle spiciform, oblong or cylindric, dense-flowered, green or slightly purplish, 1-5 cm. long by about 4 mm. diam., branches very short. Spikelets longer than their pedicels, 2-2.5 mm. long, crowded, ovoid, acute or acuminate, straight or curved, shortly or hispidly hairy, or glabrous. Lower involucreal glume ovate, $\frac{1}{2}$ - $\frac{3}{4}$ of the lower floral glume, lanceolate from a broad base, acute, 3-nerved; upper usually subcymbiform, curved, obtuse, 7-11-nerved, 2-5 mm. long. Lower floral glume as long as the upper involucreal glume, broadly ovate, obtuse, 9-nerved, palea minute; upper narrowly ellipsoid, very acute, white, smooth, polished, sides overlapping the margins of the similar palea, base obtuse, mucronulate with remains of the rhachilla.

NOTE.—Stapf has separated *Panicum angustum* Trin. Sp. Gram. Io t. 334 from *Panicum indicum* Linn. as conceived by Hook. f., and named it *Saccollepis angusta*. In his opinion the various varieties given in the F. B. I. are mostly referable to *S. angusta* Stapf.

S. indica is not a well-defined species. It appears to pass insensibly into *S. myosuroides* and *S. interrupta*. According to Hook. f., the former differs in its caudiform spike and more minute rounded spikelets, the latter in its stouter habit.

Haines thinks it is better to confine *S. indica* to those specimens with hairy spikelets. We have not followed him in this.

Locality: W. Ghats. Castle Rock (Bhide!).

S. M. Country: Khanapur, 2,500 ft., rainfall 70 in. (Sedgwick 3080!).

N. Kanara: Tank near Yellapur (Talbot!); Kulgi (Talbot 2291!); Siddhapur to Sirsi (Hallberg & McCann A118!), Karwar (Talbot 1297!, Hallberg & McCann A116!).

Ecology: This is a sporadic grass. Very common in the grass-lands of the forest borders of N. Kanara.

Distribution: Tropical Asia and Australia.

2. *SACCOLEPIS MYOSUROIDES* Haines.

PLATE 107.

Saccollepis myosuroides Haines Bot. Bh. and Or. 990.

Panicum myosuroides R. Br. Prodr. (1810) 189; Kunth Enum. Pl. (1833) I, 77; Steud. Syn. Pl. Glum. (1855) 56; Benth. Fl. Austr. VII (1878) 480 (excl. syn. *angustum*), Duthie Fodder Grasses N. Ind. (1888) 11; Hook. f. Fl. Brit. Ind. VII (1896) 42, Trin. Fl. Ceyl. V, 148;

Pram. Beng. Pl. 1175; Cooke Fl. Bomb. II (1906) 934.

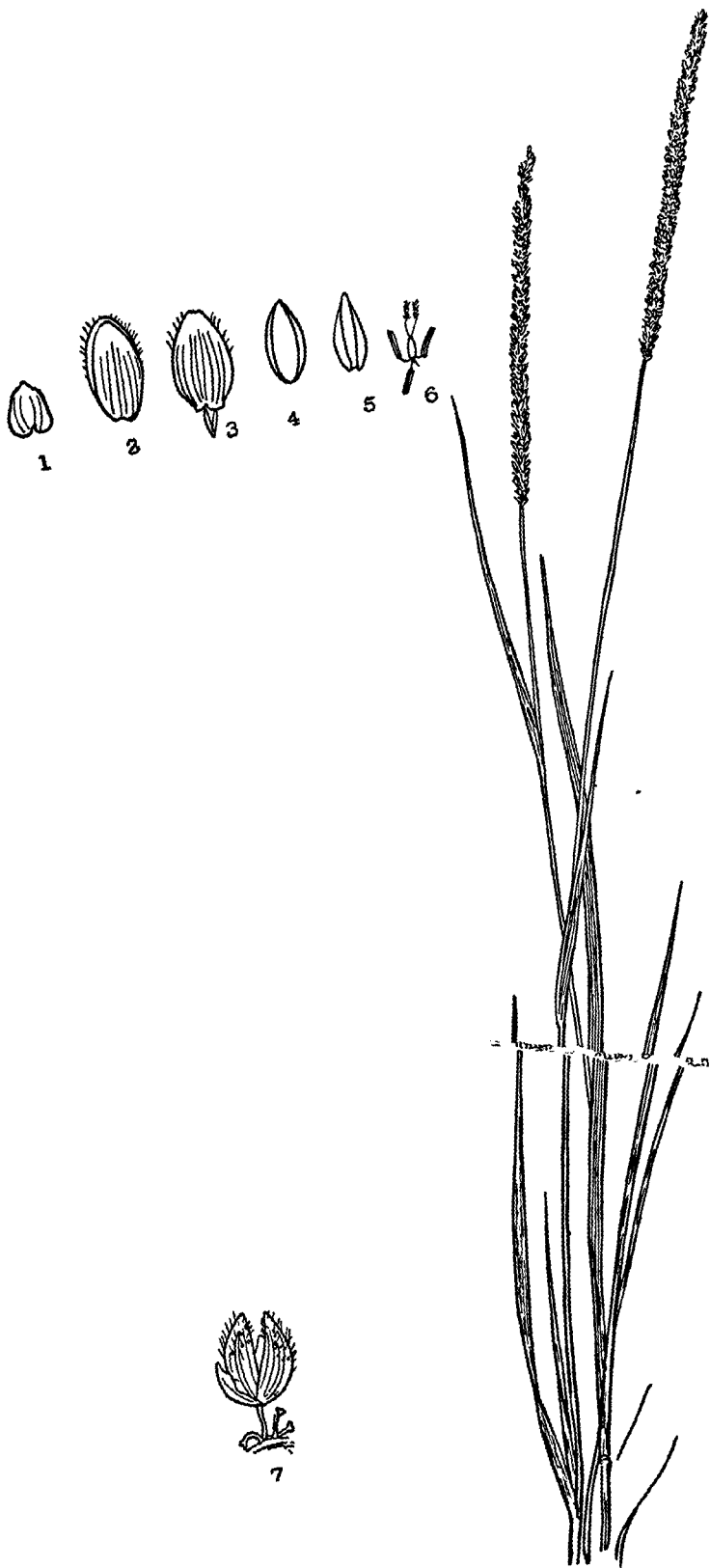
P. curvatum Roxb. Fl. Ind. I (1832) 286 (non Linn.).

Vernacular names: Kora-lom, Pokaha, Dadhina, Musa-panchi, Suphetkar.

Etymology: *Myosuroides* means resembling *Panicum myosurus* (= *Saccollepis indica* Chase).

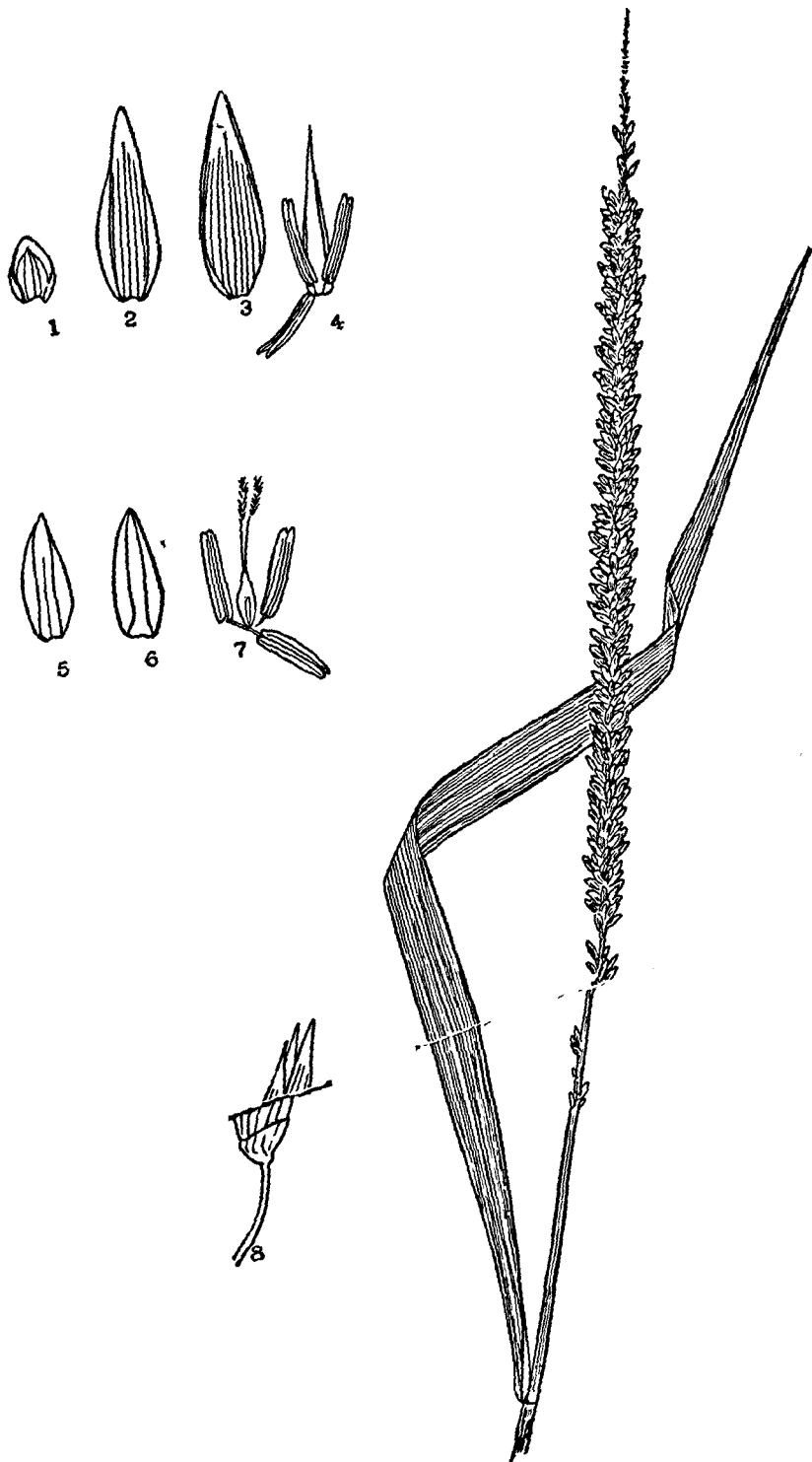
Description: Stem 60-90 cm. long, erect, or shortly creeping below, rather stout, leafy, internodes 7.5-12.5 cm. long. Leaves 15-20 cm. by 2.5-4 mm., narrowly linear, finely acuminate, margins smooth, base narrow; sheaths 5-10 cm. long, with naked margins; ligule 0.

Inflorescence a spike-like panicle 3-8-20 cm. by 4 mm., cylindric, erect, or curved; rhachis grooved, glabrous. Spikelets innumerable, 2 mm. long or less, densely crowded in small fascicles, very shortly pedicellate, globose-ovoid, obtuse, glabrous or pubescent, green or purplish. Glumes 4; lower involucreal glume about half as long as the upper, ovate, sub-acute, 3-nerved, upper involucreal glume ovate, obtuse, conspicuously 5-9-nerved, glabrous or pubescent; lower floral glume about equalling the upper involucreal glume, but broader, ovate, obtuse, very concave, 5-9-nerved, glabrous or pubescent, paleate, empty; upper



SACCIOLEPIS MYOSUROIDES HAINES

Detm R. K. Ehde



SACCIOLEPIS INTERRUPTA STAPF

Delin. R

floral glume much smaller than the lower, ovate-oblong, acute, quite smooth, white, dorsally convex with involute margins, thinly coriaceous; palea as long as the glume.

Locality: *Konkan:* Savantvadi (Woodrow); Alibag (Lisboa). We have not seen any specimen.

Ecology: Grows on the borders of lakes.

Distribution: India, Ceylon, Malay Peninsula, China, Australia. Not in tropical Africa.

Economic uses: Eaten with relish by cattle (Lisboa).

Explanation of Plate 107: *Sacciolepis myosuroides* Haines.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume and palea.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelet

3. *SACCIOLEPIS INTERRUPTA* Stapf.

PLATE 108.

Sacciolepis interrupta Stapf in Fl. Trop. Afr. IX (1920) 757; Haines Bot. Bih. and Or. (1924) 991.

Panicum interruptum Willd. Sp. Pl. I, 341, Kunth Enum. I (1838) 87, Nees Fl. Afr. Austr. (1841) 51, Roxb. Fl. Ind. I (1832) 286, Griff. Notul. III, 26, and Ic. Pl. Asiatic. t. 139, fig. 221, t. 146, fig. 2; Dalz. & Gibs. Bomb. Fl. (1861) 316, Steud. Syn. Pl. Glum. I (1855) 66, Hook. f. Fl. Brit. Ind. VII (1896) 40, Cooke Fl. Bomb. II (1908) 934, Stapf in Dyer Fl. Cap. VII, 413.

P. uliginosum Roth Nov. Pl. Sp. (1821) 50.

P. inundatum Kunth Rev. Gram. I (1829) 34, and Enum. I (1838) 88, Steud. l. c. 66.

Hymenachne interrupta Buhse in Miq. Pl. Jungh. I, 377; Miq. Fl. Ind. Bat. III, 458; Steud. l. c. 101.

P. indicum Hack. in Bolet. Soc. Brot. V, 210 (non Linn.)

Vernacular name: Pokalia

Etymology: *Interrupta* means interrupted, alluding to the panicle which is interrupted below.

Description: A large perennial grass, quite glabrous; stem reaching 1.5-1.8 m. long, ascending from a stout creeping and rooting or floating rootstock, lower nodes emitting fascicles of long stout roots clothed with root-hairs; upper internodes very long, slender. Leaves 15-30 cm. by 6-13 mm., linear, finely acuminate, soft, flat, glabrous, with smooth or scaberulous margins, base rounded or subcordate; sheaths 5-10 cm. long, with smooth margins, ligule short, broad, membranous.

Inflorescence a spike-like panicle 15-30 cm. by 6-8 mm., cylindrical, interrupted below; rachis stout, strict, channelled. Spikelets 4-5 mm. long, densely crowded in small fascicles, subsessile or shortly pedicellate, spreading, ovoid-lanceolate, acute, green. Glumes 4; lower involueral glume scarcely 1-6 mm. long, broadly ovate, obtuse, hyaline, 3-5-nerved; upper involueral glume ovate, acute, herbaceous, membranous, prominently 9-nerved; lower floral glume about equalling the upper involueral glume, ovate, acute, 7-nerved, paleate, male or barren, the palea hyaline; upper floral glume shorter than the lower, ovate-oblong, subacute, thinly coriaceous, white, polished, dorsally convex, the palea thinly coriaceous, as large as the glume. Anthers purple, much exserted. Grain obovoid, apiculate.

Very variable in size and shape, especially the panicle which varies a good deal as to colour.

Locality: *Sind* (Woodrow teste Cooke)

Konkan: Bassein, tank (Burns!); Wada, tank (Ryan 453!); Nagotna (Gammie 16074!); Borivli, Kanari, in water (McCann A120!); Bhivandi (Chibber!), Vehar (Sabnis!); Gokura Creek, Bassein (Garade 1708!), Virar, on bank of a tank (McCann 9583!); Panvel (Woodrow); Vengurla (Woodrow); margins of tanks throughout the Konkan (Dalzell & Gibson).

W. Ghats: Fingerwadi, Igatpuri (Blatter & Hallberg 3925!); Londa, in water (Gammie 15854!).

S. M. Country: Tadas, tanks (Sedgwick & Bell 4916!); Hulkop (Sedgwick & Bell 3174!); Belgaum (Herb. Econ. Bot. Poona!).

N. Kanara: Sursi-Siddhapur (Hallberg & McCann A117!); Tinas Ghat (Gammie 15791!).

It is doubtful as to whether Woodrow's plant from Sind was correctly named as this grass is one of moist regions.

Ecology : Usually inhabiting marshy and swampy places such as ricefields and the banks of tanks ; also found in deep standing water

Distribution : Tropical and S. Africa, India, Ceylon, Malaya.

Explanation of Plate 108 : *Sacciolepis interrupta* Stapf.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume
4. Palea of lower floral glume and stamens.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.
8. Spikelet.

56 PSEUDORAPHIS Griffith.¹

(formerly under *Chamaeraphis* R. Br.).

Pseudoraphis differs from *Chamaeraphis* in having the spikelets in paniced racemes, whilst in the latter they are on the axis of a solitary spike-like raceme.

Species about 5.—From India to Australia.

1. PSEUDORAPHIS ASPERA (Koen.) Pilger.

PLATE 108.

Pseudoraphis aspera (Koen.) Pilger in Notizbl. des Bot. Gart. u. Museum Berlin-Dalhem X, no. 93 (1928) 210.

Chamaeraphis aspera Nees in Wall. Cat. no. 8679 ; Merrill Fl. Manila (1912) 96.

C. spinescens Poir. Encycl. Méth. Suppl. II (1811) 189 ; Hook. f. Fl. Brit. Ind. VII (1896) 62 ; Lisboa Bomb. Grasses (1896) 25 ; Cooke Fl. Bomb. II (1908) 922.

Etymology : *Pseudoraphis* is derived from *pseudo*, and *raphis*, needle, in allusion to the awns

Description : Forming floating much-branched masses with leafy ascending stems 30-90 cm. long. Leaves 2.5-7.5 cm. by 1.6-3 mm., flat, acuminate, narrowly linear-lanceolate, smooth or scabrid, base narrowed, sheaths long, loose, with naked margins ; ligule a ridge of minute hairs

Panicle 5-10 cm. long, shortly pedunculate, more or less contracted, rachis angular, sulcate ; branches filiform, angular, grooved, flexuous, few- or many-flowered, the lower 2.5-5 cm. long, the awn-like tips 4-13 mm. long. Spikelets (including their awn) 6-8 mm. long, subsessile. Glumes 4 ; lower involucre scarcely 0.8 mm. long, orbicular or subquadrate, usually rounded at the apex, hyaline ; upper involucre glume 6-8 mm. long (including the awn), lanceolate, setosely scabrid on the sides, membranous, 9-11-nerved, with a long scabrid awn which is sometimes as long as the body of the glume ; lower floral glume shorter than the upper involucre glume, finely acuminate or awned, 7-nerved, male paleate, membranous, the palea hyaline, smaller than the glume, linear-oblong, subacute ; upper floral glume about 2 mm. long, ovate-lanceolate, acute, female, nerveless, the palea hyaline.

Locality : *Konkan :* Bassein, Nirmal tank (Collr. unknown !) ; Thana (McCann 9828 !) ; Antop Hill (McCann !) ; Salsette, in tanks (McCann !) ; Wangni (Woodrow).

W. Ghats : Khandala, on banks of village tank (McCann !) ; Londa, in a pond (Bhide !) ; Mahabaleswar Lake (McCann !).

S. M. Country : Honapur Tank, Kunnur (Sedgwick & Bell 4928 !).

N. Kanara : In tanks (McCann !) ; Karwar, in marshy places (Talbot 1506 !) ; Halyal (Talbot 2109 ! 2148 !).

Ecology : Usually growing submerged in water with the panicle and a few leaves above the surface. It is not a tank-floater, but roots in the mud and sends up fine stems which project from the water for 20-30 cm. and are leafy above the water only.

Distribution : India, Ceylon, S. China, Philippines, E. Australia.

¹ Pilger has left one species under *Chamaeraphis* viz. *C. hordseana* R. Br. of N. Australia. All the other species have been put under *Pseudoraphis* Griffith. Not. ad Pl. As. III (1861) 29. We have not seen the diagnosis of this genus as yet except the few meagre lines given by Griffith himself. See R. Pilger, Ueber *Chamaeraphis* R. Br. in Notizbl. des Bot. Gart. u. Museum Berlin-Dalhem X, no. 93 (1928) 207-210.



PSEUDORAPHIS ASPERA PILGER.

Desgn. R. K. Bhide



CYRTOCOCCUM PILIPES A. CAMUS.

Explanation of Plate 109 : *Pseudoraphis aspera* Pilger.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume
4. Lower floral glume with palea
5. Upper floral glume with palea
6. Grain

57. CYRTOCOCCUM Stapf.

Perennial. Culms weak, rising from a decumbent or creeping and rooting base. Leaf-blades flat, linear-lanceolate or almost linear. Ligules membranous, short.

Spikelets on long to very long and capillary or short pedicels, widely scattered or approximate, obliquely obovate to semiobovate, laterally much compressed, falling entire from the pedicels of very loose and open or contracted and dense panicles. Involucral glumes thinly membranous, unequal to subequal, 3-5-nerved. Lower floret barren with or without a palea, glume similar to the upper involucral glume, palea, if present, narrow, 2-nerved. Upper floret about as long as—or almost as long as the lower, hermaphrodite, glume narrowly boat-shaped, papery to subcrustaceous with firm very narrowly involute margins, obsoletely 5-nerved; palea subequal to the glume, with a narrow convex back, of the same substance as the valve, with fine keels and thin flaps. Lodicules 2, minute, broadly cuneate. Stamens 3. Styles distinct; stigmas sublaterally exerted high up. Grain not known.

Species 6 or 7.—Tropical Africa, Indo-Malaya.

None of the species here described were mentioned by Cooke. Hook. f. in F. B. I. has them under *Panicum*, sect. *Gibbosae*.

I. Spikelets shortly pedicelled.

- | | | |
|--------------------------|-----------|-------------------------|
| 1. Leaves 2.5-5 cm. long | | 1. <i>C. trigonum</i> . |
| 2. Leaves 5-15 cm. long | | 2. <i>C. pilipes</i> . |

II. Spikelets on capillary pedicels which are much longer than

- | | | |
|---------------|-----------|-----------------------|
| the spikelets | | 3. <i>C. patens</i> . |
|---------------|-----------|-----------------------|

1. CYRTOCOCCUM TRIGONUM A. Camus.

Cyrtococcum trigonum A. Camus in Bull. Mus. Hist. Nat. 27 (1921) 118.

Panicum trigonum Retz. Obs. III (1783) 9 (excl. syn. *Burm.*), Roxb. Fl. Ind. III (1832) 305; Kunth Enum. Pl. I (1838) 116, Nees Agrost. Bras. 206; Roxb. Fl. Ind. I (1832) 305; Hook. f. Fl. Brit. Ind. VII (1896) 56.

P. diffforme Roth Nov. Sp. (1821) 52.

P. radicans Buhse in Miq. Pl. Jungh. 375; Miq. Fl. Ind. Bat. III, 453 (non Retz.).

P. gibbum Steud. Syn. Pl. Glum. (1855) 87.

Etymology : *Cyrtococcum* is derived from *kyrtos*, curved, gibbous, and *coccus*, alluding very likely to the obliquely obovate or semiobovate spikelets.

Description : Perennial. Culms decumbent, branching, interlaced below; branches erect. Leaves 2.5-5 cm. long, linear-lanceolate, glabrous or laxly hairy. Sheath glabrous or margin ciliate. Ligule rounded.

Panicle 25-35 mm. long, contracted, rachis and short suberect branches glabrous. Spikelets 1.5 mm. long, very shortly pedicelled, hispidulous. Lower involucral glume about $\frac{1}{2}$ the length of the lower floral glume, obtuse or acute, 3-nerved, pale brown; upper pale brown. Lower floral glume 5-nerved, pale brown, upper naked or bearded at the tip.

Locality : *W. Ghats*. Matheran, Harrison's Springs and Monkey Point (D'Almeida A251 & A252!).

N. Kanara. Kurvatti and elsewhere (Sedgwick!).

Ecology : This gregarious grass grows in high deciduous forests of N. Kanara, associated with bamboo. According to Roxburgh it grows on pasture ground and under the shade of trees.

Distribution : India, Ceylon, Java.

2. CYRTOCOCCUM FILIPES A. Camus.**PLATE 110.**

Cyrtococcum pilipes A. Camus in Bull. Mus. Hist. Nat. 27 (1921) 118.

Panicum pilipes Nees & Arn. ex Buhse in Miq. Pl. Jungh. III, 376; Miq. Fl. Ind. Bat. III, 453; Hook. f. Fl. Brit. Ind. VII (1896) 57.

P. hermaphroditum Steud Syn Pl. Glum. (1855) 67; Benth. Fl. Austral. VII (1878) 485.

P. oxyphyllum Hochst. ex Steud. l. c. 65.

Etymology : *Pilipes* is derived from *pilus*, a hair, and *pes*, foot or foot-stalk, alluding to the pedicels which often bear slender hairs.

Description : Perennial. Culms 30-60 cm. high, geniculately ascending from a slender, creeping, branching base, lower nodes rooting, upper subpubescent. Leaves 5-15 cm. long, 8-35 mm broad, glabrous or sparsely hairy above, puberulous beneath, finely acuminate, base narrow. Sheath glabrous or ciliate, mouth hairy. Ligule rounded.

Panicle 7-13 cm. long, contracted, branches short, rather remote, erect or spreading with short fastigiate branchlets, often slender hairs on the pedicels. Spikelets 1.5 mm. long, brown, very shortly pedicelled, glabrous. Lower involucre glume about $\frac{1}{2}$ the length of the lower floral glume, obtuse, 3-nerved. Lower floral glume 5-nerved; upper white, its palea narrow, patent, hard.

Locality : Konkan : Above Kanari Caves (McCann A133 !)

W. Ghats : Matheran (D'Almeida A132 !, Woodrow !), Mahabaleshwar, in forests, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4801 !); Pratapgad Fort (Bhide 1207 !), Castle Rock, in shade of trees (McCann A131 !, Bhide !).

S. M. Country : Belgaum (Herb. Bot. Gard. Calcutta !).

N. Kanara : Coastal forests, Karwar (Sedgwick & Bell 5113 !); Kirwatti, deciduous forests (Sedgwick 3130 !); Halyal (Talbot !); Supa, 2,000 ft (Talbot 2091 !); Yellapur (Talbot 907 !); Devimane Ghat (Hallberg & McCann A128 !); Gersoppa Falls (Hallberg & McCann A125 !); Anmod forests (Sedgwick 3252 !), Kulgi, 2,000 ft (Talbot).

Ecology : This grass grows in dense shady forests. It is gregarious.

Distribution : Mascarene Islands, Madagascar, India, Malaya, Australia, Pacific Islands.

Explanation of Plate 110 : *Cyrtococcum pilipes* A. Camus

1. Spikelets
2. Lower invol glume.
3. Upper invol glume
4. Lower floral glume
5. Palea of lower floral glume
6. Upper floral glume
7. Palea of upper floral glume.
8. Stamens, ovary and styles

3. CYRTOCOCCUM PATENS A. Camus.

Cyrtococcum patens A. Camus in Bull. Mus. Hist. Nat. 27 (1921) 118

Panicum patens Linn. Sp. Pl. (1753) 86; Burm. Fl. Ind. t. 10, f. 2; Spreng. Syst. I (1825) 322 (excl. syn. *multinode*), Kunth Enum. Pl. I (1838) 126 (excl. syn. Roxb.); Hook. f. Fl. Brit. Ind. VII (1896) 57.

P. acroscens Trin. Sp. Gram. Ic. t. 88, et corrig. vol. III, Kunth l. c. 116

P. obliquum Roth Nov. Sp. (1821) 51; Kunth l. c. 103; Miq. Fl. Ind. Bat. III, 452

P. radicans Retz. Obs. IV (1786) 18; Nees Agrost. Bras. 206; Kunth l. c. 216.

Etymology : *Patens* means open, alluding to the panicle which is contracted or open.

Description : Culms 30-90 cm. high, creeping and rooting and branched below, leafy, nodes glabrous. Leaves 5-15 cm. by 6-8 mm., ovate to linear-lanceolate, finely acuminate, thin, glabrous or ciliate below with tubercle-based hairs. Sheath with the margins and mouth ciliate. Ligule rounded.

Panicle 5-13 cm. long, contracted or effuse, usually inclined with spreading glabrous or puberulous branches naked below, and very long distant spreading branchlets, rhachis, branches and pedicels capillary. Spikelets 1.5 mm. long. Lower involucre glume $\frac{1}{2}$ - $\frac{3}{4}$ the length of the lower floral glume, ovate, obtuse, 3-nerved. Upper involucre and lower floral glume glabrous or with ciliate tips. A very variable plant.

Locality : Konkan : Vasco da Gama (Bhide !); Vetaora (Sabnis 33440 !).

W. Ghats : Castle Rock (Gammie 15579, very large specimen McCann A144 !).

S. M. Country : Tadas, in shade of trees, 2,000 ft., rainfall 35 in. (Sedgwick 2102 !).

N. Kanara : Nagargalli, forests, very abundant (Sedgwick 2892 !); Gersoppa Falls (Hallberg & McCann A126 !, Chibber !); Malamani, 1,600 ft. (Talbot 2676 !); Kulgi (Talbot 2280 !). Guddehalli, Karwar (Hallberg & McCann A127 !).

Distribution : Tropical Asia, Malaya, Pacific Islands.

58. *SETARIA* Beauv.

Annual (rarely perennial) grasses of various habit; nodes of stem glabrous or hairy; ligules a ridge of hairs.

Spikelets subsessile in contracted, cylindric or pyramidal terminal panicles, articulate on a very short pedicel, subtended by 1 to many persistent scabrid or barbed bristles (modified branchlets) which often form a one-sided involucre, but are sometimes present and absent in the same inflorescence. Glumes 4; lower involucre glume usually much the smallest, 3-5-nerved, membranous; upper involucre glume 5-7-nerved, lower floral glume more or less exceeding and resembling the upper involucre glume, usually paleate; upper floral glume coriaceous or crustaceous, 5-nerved, paleate, the palea about equalling the glume. Lodicules 2, broadly cuneate. Stamens 3. Styles distinct, stigmas laterally exserted. Grain tightly enclosed by the hardened glume and palea, oblong or ellipsoid.

In 1897, F. Lamson Scribner (in U. S. Dept. Agr. Div. Agrost. Bull. IV, 38) proposed the name *Chaetochloa* for the grasses generally known as *Setaria*. Stapf has given convincing reasons why the old name should be retained. See Kew Bull. (1920) 124-127.

Species about 100.—Warm regions of the World, a few species common as weeds in the more temperate parts.

Cooke has 5 indigenous and 1 cultivated species. We retain them all but we change *S. rhachitricha* T. Cooke into *S. homonyma* Chiov.

A. Leaves more or less plicate.

- | | |
|--|-------------------------|
| I. Perennial. Culm reaching 2-4 m. | 1. <i>S. plicata</i> . |
| II. Annual. Culm reaching 0-6 m. | 2. <i>S. homonyma</i> . |

B. Leaves flat, not plicate.

AA. Bristles not retrorsally barbellate.

- | | |
|--|-----------------------|
| I. Upper floral glume smooth | 6. <i>S. stahca</i> . |
|--|-----------------------|

II. Upper floral glume rugose

- | | |
|--|---------------------------|
| 1. Panicle spiciform, continuous; bristles 6 or more | 3. <i>S. glauca</i> . |
| 2. Panicle interrupted or subpyramidal, bristle 1 on pedicel and usually 3-4 below pedicel | 4. <i>S. intermedia</i> . |

- | | |
|---|-----------------------------|
| BB. Bristles retrorsally barbellate | 5. <i>S. verticillata</i> . |
|---|-----------------------------|

1 *SETARIA Plicata* T. Cooke

Setaria plicata T. Cooke Fl. Bomb. II (1908) 919

Panicum plicatum Lam. Ill. I (1791) 171, Jacq. Elog. Gram. I t. 1, Trin. Gram. Panic. 183, Gen. Pan. 161, Sp. Gram. Ic. t. 223, Kunth. Enum. Pl. I (1838) 94, Griff. Notul. III, 24, Ic. Pl. Asiat. t. 139, fig. 229, Duthie. Grasses N. W. Ind. (1883) 6, Fodder Grasses N. Ind. (1888) 11, Benth. Fl. Hongk. (1861) 411, Hook. f. Fl. Brit. Ind. VII (1896) 55, Trin. Fl. Ceyl. V, 157.

P. amplissimum Steud. Syn. Pl. Glum. (1855) 54

P. asperatum Kunth Rev. Gram. I (1829) 39, Enum. Pl. l. c. 39, Miq. Fl. Ind. Bat. III, 456.

P. excurrentis Trin. Pan. Gen. 131, 249, Sp. Gram. Ic. t. 49, Benth. Fl. Hongk. (1861) 412 (excl. syn.).

P. nepalense Spreng. Syst. (1805) 321, Dalz. & Gibs. Bomb. Fl. (1861) 291, Aitchis. Cat. Panjab Pl. (1869) 160

P. nervosum Roxb. Fl. Ind. I (1832) 311

P. neurodes Schult. Mant. II, 228, Duthie. Grasses N. W. Ind. (1883) 5

P. Wallachianum Nees. Fl. Afr. Austr. (1841) 49.

Etymology: *Setaria* is derived from *seta*, a bristle, referring to the involucre of bristles.

Description: Perennial; stem 0.3-2.4 m. long, erect or ascending from a woody branching rootstock, stout, leafy, nodes strigillose, internodes 5-15 cm. long. Leaves 15-60 by 1.3-7.5 cm., linear-lanceolate, finely acuminate, chartaceous, glabrous or sparsely hairy, plicate between the numerous veins, base narrow; sheaths smooth or hispid, the margins naked, or ciliate near the top only; ligule of long hairs.

Panicle 30-60 cm. long, contracted, nodding; rhachis stout, angular, scabrid; branches usually alternate, distant (the lower 7.5-10 cm. long), filiform, suberect, bearing short capillary few-flowered branchlets and bristle-like flowerless ones. Spikelets 3 mm. long, sessile or shortly pedicellate, ovoid, acute or apiculate, glabrous. Glumes 4; lower involucre glume broadly ovate, obtuse, 5-nerved, membranous, half as long as the spikelet; upper involucre glume

rather more than half as long as the upper floral glume, ovate, obtuse, 7-nerved, membranous; lower floral glume slightly longer than the upper, ovate, shortly apiculate, membranous, empty, paleate or not, 5-nerved, the palea when present small, hyaline, narrowly ovate, acute, upper floral glume crustaceous, ovate-oblong, acute or shortly apiculate, slightly transversely striate, pale yellow, with strongly involute margins; palea ovate, acute, nearly as long as the glume, faintly transversely striate and with incurved membranous margins.

Easily recognized by its lanceolate plicate leaves and open panicle. The spikelets soon fall off leaving the bare rhachis. Herbarium material seldom has the spikelets *in situ*.

Locality: *Konkan* Bombay, Victoria Gardens (McCann 5376 !); *Parel* (Lisboa); western side of the Ghats (Dalzell & Gibson).

W. Ghats Lingmala, Mahabaleshwar, in forests (Sedgwick & Bell 4642 !); Panchgani (Blatter & Hallberg B1234 ! B1235 !, McCann !).

S. M. Country. Belgaum Fort, common all over Belgaum in compounds (Sedgwick 3066 !).

N. Kanara Kuigi (Talbot 2278 !), Halyal (Talbot 2408 !).

Ecology: A tall grass growing usually in shady situations and cool places.

Distribution: India, Ceylon, Malay Peninsula and Islands, China.

Economic uses: Sometimes cultivated as an ornamental grass.

2 SETARIA HOMONYMA CHIOV

PLATE 111.

Setaria homonyma Chiov in Nuovo Giorn. Bot. Ital. n. s. XXVI, 78; Stapf & Hubbard in Fl. Trop. Afr. IX (1930) 857.

Panicum homonymum Steud. Syn. Pl. Glum. (1855) 48, Duthie Grasses N. W. Ind. (1883) 4.

P. chamaeraphis Nees ex A. Br. in Ind. Sem. H. Berol. 1855, App. 20 (*non* Trin.)

P. rhachitrichum Hook. f. Fl. Brit. Ind. VII (1896) 56 (*non* Hochst.).

Setaria rhachitricha T. Cooke Fl. Bomb. II (1908) 919.

Description: Annual, stems tufted, erect, 20-60 cm. long, glabrous, nodes softly pubescent. Leaves 7.5-20 by 1.3-2.5 cm., oblong-lanceolate, tapering to both ends, finely acuminate, flaccid, glabrous or sparsely hairy, many-veined, plicate between the veins; sheaths with ciliate margins, ligule a tuft of hairs.

Panicle 5-15 cm. long, pyramidal, rhachis of panicle angular, hairy; branches 2.5-3.8 cm. long, alternate, spreading, with bristle-like flowerless scabrid branchlets at the base of the spikelets, much longer than the spikelets, 1 (rarely 2) to each pedicel, rhachis of branches angular, sparsely hairy. Spikelets numerous, glabrous, 2.5 mm. long, densely or loosely imbricate, ovate, subacute, dorsally compressed, pale with green nerves, articulated on short scaberulous pedicels. Glumes 4; lower involucrel glume orbicular-oblong, 1 mm. long, hyaline, obscurely nerved or nerveless; upper involucrel glume 2.5 mm. long, broadly ovate, subobtuse, 5-nerved, thinly membranous, lower floral glume about equal to the upper involucrel glume, similar, 5-nerved, epaleate; upper floral glume elliptic-oblong, subacute, coriaceous, white, transversely striate, 2.5 mm. long, with strongly involute margins; palea as long as the glume, elliptic, with involute membranous margins.

Locality: *W. Ghats:* Londa (Gammie ex Woodrow).

We doubt the occurrence of this species in the Presidency. Neither Cooke nor we have seen any specimens. There are none in Herb. Kew, neither do the herbaria of the Presidency contain any. Besides, the distribution of the species is not in favour of its presence in Bombay.

Distribution: India (subtropical Himalaya, Chota Nagpur, Calcutta), tropical Africa.

Explanation of Plate 111: *Setaria homonyma* Chiov.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary, styles and lodicules.

3. SETARIA GLAUCA Beauv.

Setaria glauca Beauv. Agrost. (1812) 51; Kunth Enum. Pl. I (1838) 149, Suppl. 106; Griff. Notul. 44, Pl. Asiatic. t. 149, fig. 1; Dalz. & Gibs. Bomb. Fl. (1861) 298; Aitchis. Cat. Panjab Fl. (1869) 162; Miq. Fl. Ind. Bat. III, 466; Duthie Grasses N. W. Ind. (1883)



SETARIA HOMONYMA CHIOV

Desm.: B. K. Bhude.

- 8, Indig Fodder Grasses (1886) t X, Fodder Grasses N Ind. (1888) 14; Boiss Fl Or. V (1884) 442; Hook f. Fl Brit Ind. VII (1896) 78 (*partim*); Trin Fl Ceyl V, 162; Prain Beng Fl 1170, Cooke Fl Bomb. II (1908) 920
Panicum glaucum Linn Sp Pl. (1753) 56, Trin. Sp. Gram Ic t 195, Roxb. Fl. Ind. I (1832) 284; Benth. Fl Hongk (1861) 411
P. lutescens Weig. Obs (1772) 20
Setaria lutescens Hubbard in Rhodora XVIII (1916) 232.
S. auricoma Link. ex Lond Hort. Britt 25.
S. chrysantha Heynh Nom II, 661
S. flava Kunth Rev Gram I (1829) 46.
S. tejucensis Kunth Enum Pl I (1838) 150
Panicum alopecuroides Koen. ex Trin Gram. Panic. 162.
P. flavescens Moench. Meth (1794) 206.
P. helvolum Linn. f. Suppl (1781) 107.
P. holcoides Jacq. Eclog Gram t. 22.
P. luteum Guldenst Reis II, 58
P. paniculatum Willd. ex Nees Agrost. Bras. 242.
P. pumilum Poir. Encycl. IV, 273.
P. verticillatum Bottl. ex Spreng Syst. Veg. I (1825) 304.
Pennisetum glaucum et helvolum R. Br. Prodr (1810) 195.

Mr. C. E. Hubbard of the Kew Herbarium informs us that he changed *Setaria glauca* Auct. into *S. lutescens* on account of the synonym *Panicum lutescens* Weigel Obs (1772) 20. Dr. Stapf thinks that this name change is unnecessary and we quite agree with him after reading his MS on this question, which he kindly allowed Mr Hubbard to put at our disposal. As Dr. Stapf is now about to publish his MS, we refrain from giving his arguments in this place.

Vernacular names : Biri, Gub, Bandra, Kangri, Pingi-natehi, Naka-kora, Kolara, Bandri, Bhadi.

Etymology : *Glaucus* means sea-green, the panicles are sometimes green instead of yellow or purplish

Description : Stem 30-60 cm high, erect, or ascending, simple or branched; nodes glabrous, the lower rooting. Leaves 10-30 by 1 cm., linear, finely acuminate, flat, glabrous or sparsely hairy, with scabrid margins, base usually rounded, sheaths smooth, ligule a ridge of hairs.

Inflorescence a cylindric densely flowered spike-like raceme 2.5-12.5 cm. long, bristles of involucre 6-12, pale or reddish brown, 4-8 mm long, with very short erect or spreading teeth. Spikelets numerous, closely set along the rachis of the spike, 3 mm. long, ellipsoid, glabrous. Glumes 4, lower involucre glume less than half as long as the spikelet, broadly ovate, often shortly apiculate, 3-nerved, hyaline; upper involucre glume slightly longer than the lower, broadly ovate or suborbicular, hyaline, 5-nerved, lower floral glume thinly membranous, as long as the upper one, 5-nerved, paleate, empty or male, the palea hyaline; upper floral glume coriaceous, broadly elliptic, obtuse, dorsally convex, transversely rugose, pale

This species is readily recognized by its cylindric inflorescence. It is very variable in size and colour of the inflorescence, ranging from pale straw to sometimes deep purple. The most common tint is a slight purplish.

Locality : *Gujarat :* Nadiad (Chibber !), Ahmedabad (Saxton 1063 !); Baroda (Cooke) *Khandesh :* Toranmal (McCann A149 ! A150 !), N. slope of Chanseli (McCann A1511).

Konkan : Bhandup (McCann 3606 !), Mulgaum (McCann A147 !), Basseri (McCann 9607 !); Sion (McCann 3573 !); Thana (Lisboa).

W. Ghats : Khandala, very common (McCann 8406 !), Panchgani, behind Maratha well (Blatter 3824 !), Mahabaleshwar, common (Woodrow !, Dalzell & Gibson, Cooke).

Deccan : Shivner Fort, Junnar (Paranjpye !); Chatterashmi Hill, Poona (Ezekiel !); Shivapur, near Poona (Bhide 981 !), Purandhar, foot (McCann 5608 !); Lohagad, top (McCann 9501 !); Nasik (Lisboa).

S. M. Country : Dharwar Dist. (Sedgwick 2173 !); Dumbai, under trees (Talbot 2300 !).

N. Kanara : Dandeli (Bell 4224 !); Halyal (Talbot 2144 !); Honavar (Talbot 1063 !).

Ecology : The commonest grass of the genus almost throughout the Presidency. On rich and cultivated soil it is a common pasture grass. Cultivated as a kharif crop only in the Mulai Petha of the Poona District. Sown in June, ripens in September. It flourishes throughout the year, but is best developed during the monsoon.

Distribution : All warm, temperate and tropical regions.

Economic uses : Considered to be a fairly good green fodder. The seeds have been used as a food during famine time.

4. *SETARIA INTERMEDIA* Roem. & Schult.

Setaria intermedia Roem. & Schult Syst II (1817) 489; Kunth Enum. Pl. I (1838) 150; Aitchis. Cat Panjab Pl (1869) 162; Duthie Grasses N. W. Ind. (1883) 9, Fodder Grasses N. Ind. (1888) 14; Hook f. Fl. Brit. Ind VII (1896) 79; Trim. Fl. Ceyl. V, 163; Cooke Fl. Bomb II (1908) 920; Haines Bot. Bih. and Or. (1924) 989.

S. glauca Hochst Pl. Hohenack. no. 937.

Panicum intermedium Roth Nov Sp (1821) 47.

Vernacular names : Landgar, Churiyaka dana, Sawa, Lundi.

Description : Stem 60-90 cm. long, slender, erect or ascending; nodes glabrous, the lower often rooting. Leaves 5-23 cm. by 3-20 mm., linear-lanceolate, finely acuminate, thin, flat, sparsely hairy on both surfaces, with scaberulous margins, base narrow, sheaths long, smooth, the mouth villous, the margins ciliate especially in the upper part.

Panicle 10-15 cm. long, narrowly pyramidal; rachis glabrous, grooved; branches short, distant below, rather crowded above, dense-flowered; bristles of involucrel 3-6, about 6 mm. long, very slender, flexuous, studded with minute erect teeth, pale. Spikelets 2-2.5 mm. long, ovoid, subacute. Glumes 4, lower involucrel glume orbicular-oblong or ovate, about $\frac{1}{2}$ as long as the spikelet, hyaline, faintly 3-nerved; upper involucrel glume about half as long as the spikelet, broadly ovate, subacute, hyaline, 5-nerved, lower floral glume about equalling the upper, broadly ovate, thinly membranous, 5-nerved, paleate, empty, the palea hyaline; upper floral glume broadly ovate or suborbicular, acute, coriaceous, very concave, transversely rugulose all over, yellowish brown; palea elliptic, subacute.

Locality : Gujarat : Doongri (Chubber !); Ahmedabad (Gammie 16351 !); Nadiad (Chibber !).

Khandesh : Toranmal (McCann A152 !); Umalla village (Blatter & Hallberg 5184 !).

Konkan : Dadar, very common in Bombay Isl. (McCann A153 !); common in Salsette (McCann !).

W. Ghats : Igatpuri, common (McCann 4320 !); Khandala, common (Blatter 4410 !, McCann !), Lonavla (McCann 4466 !); Panchgani (Blatter & Hallberg B1227 ! B1272 !).

Deccan : Purandhar Fort (Bhide !, McCann 5022 ! 5595 !); Chattrashinji, Poona (Bhide !), in cultivated fields about Poona (Jacquemont 355).

S. M. Country : Dharwar (Sedgwick 1839 !); Belgaum (Ritchie 839).

N. Kanara : Yellapur (Talbot 1520 !), Halyal (Talbot 2296 !).

Ecology : A common plant of cultivation and waste land—A monsoon species.

Distribution . Temperate and tropical regions.

5 *SETARIA VERTICILLATA* Beauv.

Setaria verticillata Beauv. Agrost. (1812) 51; Kunth Enum. Pl. I (1838) 152; Dalz. & Gibs. Bomb. Fl. (1861) 294; Aitchis. Cat. Panjab Pl. (1869) 162; Duthie Grasses N. W. Ind. (1883) 9, Fodder Grasses N. Ind. (1888) 15; Reichb. Ic. Fl. Germ. t. 47, Hook. f. Fl. Brit. Ind VII (1896) 80; Trim. Fl. Ceyl. V, 163, Prain Beng. Pl. 1170; Cooke Fl. Bomb. II (1908) 921, Haines Bot. Bih. and Or. (1924) 989.

S. respuens Hochst ex Miq. Fl. Ind Bat. III, 467.

S. verticilliformis Dum. Fl. Belg. (1827) 150.

S. Rotleri Spreng Syst. Veg. I (1825) 304.

Panicum adhaerens Forsk. Fl. Aeg.-Arab. (1775) 20.

P. asperum Lam. Fl. Fr. III, 577.

P. floribundum Willd. ex Spreng. l. c. 306.

P. humile Trin. Gram. Panic. 167.

P. italicum Ucria Hort. Reg. Panhorm (1789) 54.

P. respuens Hochst. ex Steud. Syn. Pl. Glum. 52.

P. verticillatum Linn. Sp. Pl. ed. II, 82; Roxb. Fl. Ind. I (1832) 301.

P. viride Desf. Fl. Atl. I, 58.

Pennisetum verticillatum R. Br. Prodr (1810) 195.

P. respuens A. Rich. Tent. Fl. Abyss. II (1851) 379.

Vernacular names : Lapti, Churchira, Bardam, Chilaya, Chiklenta.

Description : Annual, stems erect or ascending, 30-90 cm. long, stout or slender, leafy, more or less branched, glabrous. Leaves 7-5-25 cm. by 4-20 mm., thin, flat, glabrous or sparsely

hairy and scaberulous, linear or linear-lanceolate, tapering to a fine point, base usually narrow; sheaths smooth, striate; ligule a fringe of hairs.

Panicle 2.5-12.5 cm. long, erect or curved, spike-like, cylindric or oblong, coarsely bristly; bristles of the involucre 1 or few, 4-8 mm. long, closely studded with conspicuous downward-pointing teeth. Spikelets 2 mm. long, ellipsoid, obtuse, glabrous. Glumes 4; lower involucre glume 0.8 mm. long, ovate, acute, hyaline, faintly 3-nerved; upper involucre glume about as long as the spikelet, ovate, subacute, thinly membranous, 5-nerved; lower floral glume similar to the upper involucre glume, 5-nerved, empty, paleate or not, the palea when present hyaline, very small, upper floral glume elliptic-oblong, plano-convex, subobtusely, coriaceous, straw-coloured, faintly striatulate and with incurved margins, palea as long as the glume, coriaceous, elliptic, faintly striatulate.

Easily distinguished from the other species by its readily sticking to one's clothing (*Panicum adhaerens* Forsk.).

Locality: *Sind*. Umarkot (Sabnis B748!), Sanghar (Sabnis B758!), Mirpurkhas, cultivated fields (Sabnis B701!), Bughar, Indus River (Blatter & McCann D640!); Ghulam-alla, garden (Blatter & McCann D641!), Mirpur Sakro (Blatter & McCann D642!).

Cutch (Blatter 3744!).

Kathawar Morvi (Woodrow).

Gujarat Ahmedabad (Sedgwick!), Baroda (Woodrow).

Konkan Sion (Herb. St. X. C. 5236!), Juvem (Herb. St. X. C. 4237!); Malabar Hill (McCann 3626!); Byculla (McCann!).

S. M. Country: In a village, Dharwar Dist. (Sedgwick 3109!).

Ecology: Grows in shady places. "Delights in a rich soil in out of the way corners, where there is rubbish" (Roxburgh). This is essentially a village grass. It is semiscandent in hedges in all village sites of the Carnatic and never seen far from habitations.

Distribution: India, Ceylon temperate and tropical regions.

Economic uses: Eaten by cattle when young. The grain is eaten by poorer classes.

*6. SETARIA ITALICA Beauv.

Setaria italica Beauv. Agrost. (1812) 51; Reichb. Ic. Fl. Germ. t. 47; Aitchis. Cat. Panjab Pl. (1869) 162; Duthie Grasses N. W. Ind. (1883) 8, Field and Gard. Crops 5, t. 25, Fodder Grasses N. Ind. (1888) 15, Miq. Fl. Ind. Bat. III, 467; Hook. f. Fl. Brit. Ind. VII (1896) 78; Pram Beng. Pl. 1170, Haines Bot. Bih. and Or. (1924) 988.

Panicum italicum Linn. Sp. Pl. (1753) 56, Roxb. Fl. Ind. I (1832) 302, Dalz. & Gibb. Suppl. (1861) 98.

Pennisetum macrochaetum Jacq. Eclog. Gram. III, 36, t. 25; Rheede Hort. Malab. XII, t. 79.

Vernacular names: Italian Millet, Foxtail Millet, Rala, Bhadh, Kang.

Description: Annual. Culms erect, tufted, 0.6-1.5 m. high. Leaves linear or lanceolate-linear, acuminate, 7-10 mm. broad or broader. Sheath densely ciliate on margin and mouth.

Panicle 7-13 cm. long, 10 mm. wide or more, dense, inclined or nodding, simple, cylindric or lobed or compound, rachis very hairy. Spikelets oval, 2-2.5 mm. long, in small clusters on the abbreviated branchlets of the panicle, with 2-3 bristles below each pedicel, bristles nearly smooth or microscopically barbellate, 5-8 mm. long, barbs suberect or spreading. Lower involucre glume oblong or subglobose, hyaline, smooth, upper ovate, obtuse or rounded, about $\frac{2}{3}$ the length of the upper floral glume, 5-nerved. Lower floral glume hyaline, delicately 4-5-nerved, as long as and same shape as the upper floral glume, but not concave. Upper floral glume oval or elliptic or subglobose, concave, hardening, variable in length, not rugose but smooth and microscopically cancellate.

Locality: *Konkan*. Bombay, cultivated in compound of the Training College (McCann 4286!); Bassein, Botanic Garden (Josh!) ; Chowpatti, Bombay (Herb. St. X. C. 4299!).

Deccan Ganeshkhind Botanic Gardens (Patwardhan!).

S. M. Country. Dharwar, cultivated (Talbot 2014!).

In the Presidency it is cultivated chiefly in the Carnatic, Satara and Ahmednagar, and to some extent in Gujarat. In 1914-15 the area under cultivation was 247,677 acres.

Ecology: This grass does best on medium light soil and thrives better than other millets with deficient rainfall. It is sown usually in July-August without any subordinate mixture, in an unmanured field. It ripens in about 3 months.

Distribution: Most warm, temperate and tropical countries.

Origin: See DeCandolle, Origin of cultivated plants, p. 378.

He sums up his investigations in these words. "The sum of the historical, philological, and botanical data make me think that the species existed before all cultivation, thousands of years ago in China, Japan, and in the Indian Archipelago. Its cultivation must have early spread towards the West, since we know of Sanskrit names, but it does not seem to have been

known in Syria, Arabia and Greece, and it is probably through Russia and Austria that it early arrived among the lake-dwellers of the stone age in Switzerland.

Economic uses : The grass is much esteemed as an article of human food. The straw is considered to be nourishing, but in many parts it is only used for feeding goats. In other localities it is utilised for bedding and thatching houses.

Medicinal uses : The grass is sometimes apt to produce diarrhoea. It is said to act as a diuretic and astringent. It is also used externally in rheumatism. Said to be a popular remedy in parturition.

59. TRICHOLAENA Schrad.

Erect tufted perennial (rarely annual) grasses. Leaves narrow, ligule a fringe of hairs.

Spikelets 1-2-flowered, articulate on their pedicels, paniculate, laterally compressed, clothed with long silky hairs. Glumes 3 or 4; lower involucrel glume somewhat remote from the upper, often reduced to a minute scale or obsolete, upper involucrel glume membranous, emarginate or mucous, or finely mucronate or aristate from the sinus, 5-nerved, usually hairy, lower floral glume like the upper involucrel glume, male or barren, with a hyaline 2-nerved subequal palea; upper floral glume much smaller than the lower, thinly chartaceous, glabrous, shining, obtuse or emarginate, obscurely 5-nerved, 2-sexual. Lodicules 2, small. Stamens 3. Styles free.

Species 10-12.—Chiefly African. The following 2 in the Bombay Presidency.

1. Spikelets up to 4 mm. long; lower involucrel glume minute or obsolete; lower floral glume apiculate (not awned) 1. *T. Teneriffae*.
2. Spikelets reaching 10 mm. long; lower involucrel glume 2.5 mm. long, lower floral glume awned 2. *T. Wightii*.

1. TRICHOLAENA TENERIFFAE Parl.

Tricholaena Teneriffae Parl. in Webb. & Berth. Phyt. Canar. III, pt. 2 (1848) 425, Fl. Ital. I, 131, Lisboa Bomb. Grasses (1896) 27; Hook. f. Fl. Brit. Ind. VII (1896) 65; Cooke Fl. Bomb. II (1908) 924.

Panicum plumosum Presl Fl. Sic (1826) 43.

P. saccharoides Trin. Gram. Panic. 245.

P. Teneriffae R. Br. Prodr. (1810) 189; Boiss. Fl. Or. V (1884) 434.

P. villosum Presl Gram. & Cyp. Sic. 18.

Saccharum Teneriffae Linn. f. Suppl. (1781) 106, Sibth. Fl. Graec. I, t. 53 (excl. anal.).

Agrostis plumosa Ten. Fl. Nap. Prodr. Suppl. I, 59.

Etymology : *Tricholaena* is derived from *thrix*, hair, and *laena*, mantle, referring to the silky hairs on the spikelets.—Tenerife is a volcano in the Canary Islands.

Description : Perennial, stems many from a woody rootstock, geniculate below, slender, rigid. Leaves 3-7.5 cm. by 1-6.3 mm., narrowly linear-lanceolate, finely acuminate, convolute, rigid, glabrous, sheaths glabrous, ligule a narrow softly hairy ridge.

Inflorescence of slender erect panicles 6.3-11.5 cm. long; branchlets and pedicels capillary. Spikelets up to 4 mm. long, clothed with silky hairs. Glumes 3 (rarely 4); lower involucrel glume minute or obsolete; upper involucrel 3 mm. long, ovate, acute, densely silky; lower floral glume 4 mm. long, ovate, acute, apiculate, paleate, the palea narrowly oblong, subobtusely, hyaline; upper floral glume 2.5 mm. long, ovate-oblong, obtuse, coriaceous, shining; palea as long as the glume, oblong-lanceolate, subacute. Anthers 2-5 mm. long, narrowly linear. Stigmas 2.5 mm. long, exserted, sessile or nearly so, plumose.

Locality : Sind. Laki (Bhidi !); Thano-Bullo-Khan (Woodrow).

Distribution : Punjab, W. Peninsula; westward to Sicily and N. Africa, Abyssinia, tropical Africa.

2. TRICHOLAENA WIGHTII Nees.

PLATE 112.

Tricholaena Wightii Nees ex Steud. Syn. Pl. Glum. (1855) 93; Lisboa Bomb. Grasses (1896) 27; Hook. f. Fl. Brit. Ind. VII (1896) 65; Cooke Fl. Bomb. II (1908) 925.

Rhynchelytrum Wightii Duthie Fodder Grasses N. Ind. (1888) 21.

R. villosum Chiov. in Ann. Istat. Bot. Roma VIII, 310; Stapf & Hubbard in Fl. Trop. Afr. IX (1930) 875.

Monachyrion villosum Parl. in Hook. Niger Fl. (1841) 191.

Panicum megalanthum Steud. Syn. Pl. Glum. (1855) 93.

Tricholaena longiseta in Bull. Herb. Boiss. II, App. 2, 23, 95 (non Hochst.).



TRICHOALAENA WIGHTII NEES

Desm: R. K. Bhide.

T. Dregeana Hack. in Bull. Herb. Boiss. IV, App. 3, 15 (partim, non Durand & Schinz).

T. villosa Durand & Schinz Consp. Fl. Afr. V, 771.

Melinis Wightii Hack. in Oesterr. Bot. Zeitschr. (1901) 464.

M. Bertlingii Mez in Engl. Bot. Jahrb. LVII, 195.

M. Rangen, pulchra, Barbeyana et affinis Mez l. c. 195, 196.

Description : Stems 15-45 cm. high, tufted, stout or slender. Leaves 2.5-15 cm. by 3-6 mm., linear, finely acuminate, flat, glabrous or hairy, sheaths glabrous or hairy with bulbous-based hairs; ligule a hairy line.

Inflorescence a narrow panicle 5-12.5 cm. long, branchlets and pedicels capillary, flexuous. Spikelets variable in size, sometimes exceeding 1 cm. long (including the awns), silky-hairy. Glumes 4; lower involucrel glume 2.5 mm. long, linear, obtuse, distant from the others, strongly bearded at the base; upper involucrel glume ovate-lanceolate, tumid at the base, obtuse or subacute, silky-hairy, the midnerve produced from the back into a capillary awn nearly 5 mm. long, lower floral glume similar to the upper involucrel glume, with a similar awn, silky-hairy, paleate, male, the palea narrow, hyaline; upper floral glume 2.5 mm. long, elliptic-oblong, obtuse, concave, smooth, thin, 2-sexual, palea as long as the glume. Anthers 2.5 mm. long. Stigmas 1.6 mm. long, with distinct styles free to the base or nearly so.

Locality : *Konkan* : Commonly cultivated in gardens in Bombay (McCann !); *Sewri*, probably an escape (Hallberg 3592 !).

W. Ghats : Khandala Ghat, Satara Dist. (McCann !), Mahabaleshwar (Lisboa); Panchgani (Lisboa).

Deccan : Satara Dist. (McCann !), Diva Ghat (McCann 5590 !); Malhargad (Woodrow), Poona (Woodrow), Khandala Ghat (McCann !).

S. M. Country : Badami (Bhide !, Woodrow 23).

Distribution : W. Peninsula, Rajputana, Arabia, Cape Verde Islands.—A very doubtful native as it is so often cultivated in gardens.

Explanation of Plate 112 : *Tricholaena Wightii* Nees.

1. Spikelet.
2. Lower invol. glume
3. Upper invol. glume (side view).
4. Lower floral glume
5. Palea of lower floral glume and stamens.
6. Upper floral glume (side view).
7. Palea of the upper floral glume
8. Ovary

60. *Pennisetum* Pers.

Annual or perennial grasses. Leaves narrow.

Inflorescence of spike-like racemes of involucrellate clusters of shortly pedicellate spikelets articulate on a simple rachis; involucrels consisting of unequal scabrid or plumose simple or branched bristles. Spikelets 1-6 in each involucrel, persistent on their pedicels, 1-2-flowered, obovoid or lanceolate. Glumes 3 or 4; lower involucrel glume small or 0; upper involucrel glume subequal to the lower floral glume, 5-7-nerved, awned or not, rarely absent; lower floral glume paleate or not, male or empty; upper floral glume sessile, coriaceous, 2-sexual or female. Lodicules 2. Stamens 3; anthers linear. Styles long, free or connate below. Grain oblong, free within the hardened glume and palea.

Species about 40.—In most warm countries.

Cooke has 6 indigenous and 1 cultivated species. We add another cultivated species : *P. purpureum* Schum & Thoun. The name *P. cenchroides* Rich. has to cede to *P. ciliare* Link., and *P. typhordeum* Rich. to *P. spicatum* Roem & Schult.

A. Anther-cells not bearded at the tips

I. Bristles of involucrel free to the base.

1. Inner bristles of involucrel scaberrulous, not ciliate.
 - a. Leaves 30-45 cm. long 1. *P. Alopecuroides*.
 - b. Leaves 7-15 cm. long 2. *P. dichotomum*.
2. Inner bristles of involucrel ciliate below the middle, but naked at the base. Involucrel stipitate 3. *P. orientale*.

3. Inner bristles of involucre densely villous or ciliate below the middle, not naked at the base. Involucre sessile.
 - a. Inner bristles of involucre densely villous 4. *P. pedicellatum*.
 - b. Inner bristles of involucre laxly ciliate with long silky hairs, not villous 5. *P. setosum*.
- II. Inner bristles of involucre dilated below, their bases confluent in a coriaceous disk 6. *P. ciliare*.
- B. Anther-cells more or less bearded at the tips. Styles connate.
 - I. Culms less than 2 m. high. Palea of upper floral glume truncate 7. *P. spicatum*.
 - II. Culms more than 2 m. high. Palea of upper floral glume minutely 2-toothed 8. *P. purpureum*.

1. *Pennisetum alopecuroides* Nees.

PLATE 113.

Pennisetum alopecuroides Nees ex Steud. Syn. Pl. Glum. (1855) 102; Duthie Grasses N. W. Ind. (1883) 10; Lisboa Bomb. Grasses (1896) 35; Hook. f. Fl. Brit. Ind. VII (1896) 84; Cooke Fl. Bomb. II (1908) 914.

P. Hohenackeri Hochst. ex Steud. l. c. 103.

P. aureum Dalz. & Gibs. Bomb. Fl. (1861) 294.

Gymnothrix alopecuroides Nees in Wight Cat. no. 1663; Steud. l. c.

G. cenchroides Roem. & Schult. Syst. II, 499.

Etymology : *Pennisetum* is derived from *penna*, a feather, and *seta*, a bristle.—*Alopecuroides* is the name of a nearly related genus of grasses.

Description : Perennial; stems 60-90 cm. high, stout, erect, densely tufted below, subdistichously branched above; branches strict, erect. Leaves 30-45 cm. by 2-5-4 mm., coriaceous, convolute, glabrous, with usually a tuft of soft hairs at the base; sheaths glabrous or nearly so; ligule a small hairy ring.

Racemes spike-like, 12-18 cm. long; rachis flexuous, scaberulous, angular; involucre very shortly pedicellate; bristles very unequal, the longest 2-3 times as long as the spikelet, scaberulous. Spikelets reaching nearly 10 mm. long, lanceolate, acute, solitary. Glumes 4; lower involucre 1-2 mm. long, suborbicular, hyaline; upper involucre 4 mm. long, lanceolate, acuminate, 3-nerved, hyaline; lower floral glume 8 mm. long, lanceolate, acuminate, 7-11-nerved with involute margins; upper floral glume slightly longer than the lower one, lanceolate, acuminate, 5-nerved, with involute margins, 2-sexual; palea lanceolate, as long as the glume.

Locality : Sind (Dalzell).

Gujarat : N. Sonasan, on dry sandy bank (Sedgwick !).

Khandesh : Toranmal, very common around lake (McCann 9862 !).

W. Ghats : Lonavla (Lisboa), Panchgani (Blatter 3802 !, Blatter & Hallberg 1292 !, McCann !), Londa (Gammie 15827 !).

Deccan : Poona (Woodrow !, Lisboa, Jacquemont 407 !); near Poona (Gammie 15314 !); Nasik (Bourke !, Blatter & Hallberg 9863 !, Lisboa); Purandhar, N. foot (McCann 5045 !); Lohagad, plain (McCann 9502 !).

S. M. Country : Dharwar (Sedgwick 3718 !); Belgaum (Woodrow).

N. Kanara : Halyal (Talbot 2090 !).

Ecology : Commonly found in clumps on sandy soil near streams and lakes. It is extremely tough and occupies sometimes large patches of land excluding almost everything else. *Dichanthium carcosum* is commonly found growing together with this grass.

Distribution : Rajputana, Central India, W. Peninsula.

Economic uses : "In Poona brooms are said to be made of it, and at Mt. Abu it is employed in the manufacture of cordage." (Lisboa.)

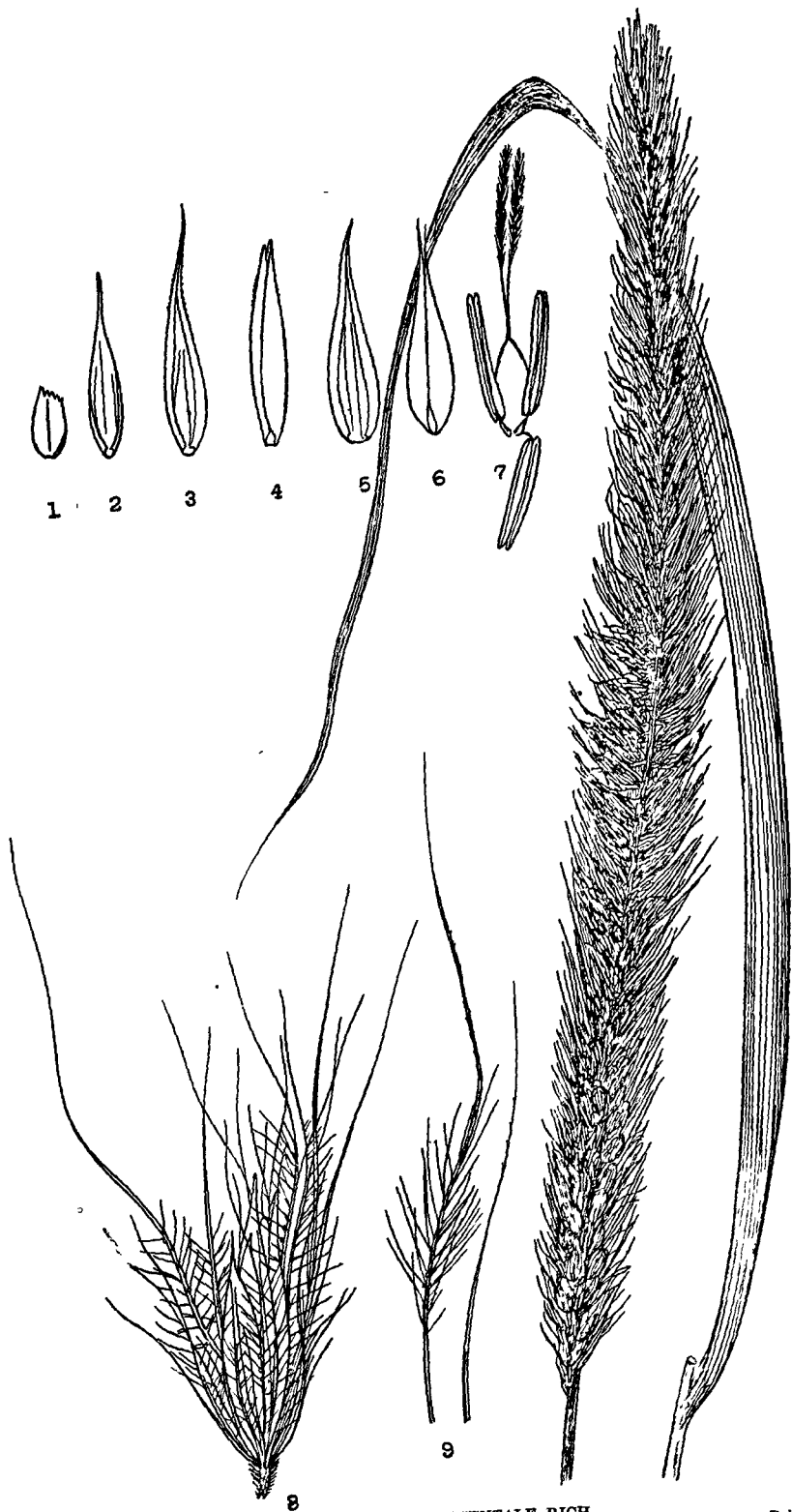
Explanation of Plate 113 : *Pennisetum alopecuroides* Nees.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.



PENNISETUM ALOPECUROS NEES.

Desin: B. K. Bhude.



PENNISETUM ORIENTALE RICH.

Desgn: E. K. Bh

2. *Pennisetum dichotomum* Del.

Pennisetum dichotomum Del. Fl. d'Egypt. (1813) 159, t. VIII, fig. 1., Trin. Diss. II, 66, Pan. Gen. 94; Kunth Enum. Pl. I (1838) 161, Suppl. 110, Steud. Syn. Pl. Glum. (1855) 105; Boiss. Fl. Or. V (1884) 444; Aitchis. Cat. Panjab Pl. (1869) 162; Duthie Grasses N. W. Ind. (1883) 10, Hook. f. Fl. Brit. Ind. VII (1896) 85; Aschers. Schweinf. III. Fl. d'Ég. 161, no. 1131 Cooke Fl. Bomb. II (1908) 915.

P. phalaroides Schult. Mant. II, 147.

Gymnothra longiglumis Munro in Cat. Griff. etc. Pl. 56 (*nomen*).

Cenchrus ramosissimus Poir. Encycl. VI, 51; Dalz. & Gibs. Bomb. Fl. (1861) 294.

Phalaris setacea Forsk. Fl. Aegypt.-Arab. (1775) 20.

Panicum dichotomum Forsk. 1 c.

Description : Perennial, quite glabrous, bushy, stem distantly dichotomously branched, the branches often fascicled, internodes long, rigid, smooth and polished. Leaves 7.5-15 cm. by 2.5-4 mm., narrowly linear, tapering to a subulate point, rigid.

Racemes 6.5-12.5 cm. long, cylindric, pale (nearly white); rachis more or less scaberulous, angular; involucl sessile or nearly so, bristles very numerous, slender, pale, unequal, the longer twice as long as the spikelet, free to the base. Spikelets usually solitary, 8 mm. long, lanceolate, acuminate, nearly white. Glumes 4, lower involuclral glume nearly 6 mm. long by 1.6 mm. broad at the base, lanceolate, acuminate, 1-nerved, hyaline; upper involuclral glume 8 mm. long, lanceolate, acuminate, 5-7-nerved, hyaline, lower floral glume as long as the upper involuclral glume, ovate-lanceolate, cuspidately acuminate, paleate, 5-nerved, the palea nearly as long as the glume, lanceolate, acute, upper floral glume as long as the lower one, ovate-lanceolate, acuminate, cuspidate, 5-nerved, palea 6 mm. long, lanceolate, acuminate. Styles much exerted beyond the spikelets, free nearly to the base, densely plumose in the upper part.

Locality : *Sind* : On sand hills (Stocks, Woodrow); Bholari (Bhude !); Nasarpur, sandy plains (Sabinus B1050 !); Sehwan, sand dunes (Sabinus B673 !).

Gujarat In hedges (Dalzell & Gibson).

Ecology : A desert plant growing on sand hills, stony ground and amongst rocks.

Distribution : Punjab, N. W. Provinces, W. Peninsula, Afghanistan, Persia, Arabia, Syria, Sinai, Egypt.

Economic uses : Collected for fodder, horses and donkeys relish it, one of the most valuable of desert plants.

3. *Pennisetum orientale* Rich.

PLATE 114

Pennisetum orientale Rich. in Pers. Syn. I (1805) 72, Boiss. Fl. Or. V (1881) 445; Duthie Grasses N. W. Ind. (1883) 10; Hook. f. Fl. Brit. Ind. VII (1896) 86, Cooke Fl. Bomb. II (1908) 915; Muschler Fl. Egypt (1912) 66, Haines Bot. Bih. and Or. (1924) 986.

P. araneosum Edgew. in Journ. As. Soc. Beng. XXI (1852) 180; Aitchis. Cat. Panjab Pl. 162; Duthie Grasses N. W. Ind. (1883) 10.

P. asperifolium Kunth Rev. Gram. I (1829) 49.

P. elatum Hochst. ex Steud. Nom. ed. 2, II (1840) 297.

P. fasciculatum Trin. in Mem. Acad. Petersb. ser. 6, III, II (1835) 181.

P. macrostachyum Fresen. in Mus. Senkenb. II, 135 (*non* Trin.).

P. persicum Boiss. & Buhse in Nov. Mem. Soc. Nat. Mosc. XII (1860) 232.

P. Ruppellii Steud. Nom. 1 c.

P. sinasium Don, in Ann. Sc. Nat. ser. 2, II (1834) 11, Duthie 1 c.

P. tenue et variable Fig. & Notar. in Mem. Acad. Torino, ser. 2, XII (1852) 246, 248.

P. tiberiadis Boiss. Diagn. ser. I, XIII, 43.

Cenchrus asperifolius Desf. Fl. Atlant. II, 388.

C. orientalis Willd. ex Trin. Diss. II, 69.

Panicum orientale Willd. Enum. Hort. Berol. II, 1031.

Description : Perennial, 60-120 cm. high, stem suberect from a stout rootstock, leafy, clothed below with withered sheaths. Leaves 15-30 cm. by 3-10 mm., narrowly linear, finely acuminate, flat, smooth, the margins scaberulous ciliate close to the obtuse or truncate base; sheaths glabrous with ciliate margins; ligule a shortly ciliate line.

Racemes reaching as much as 25 cm. long; rachis subterete, pubescent; involucl shortly stipitate, the stipe pubescent; bristles very unequal, the longest about 20 mm. long (rarely one may be found 2.5 cm. long), often purplish, scaberulous, the inner ciliate with long hairs below the middle, but naked at the base. Spikelets usually 2-6 (rarely solitary) within the involucl, reaching 6 mm. long, on pubescent pedicels. Glumes 4, lower involuclral glume 1.6-2 mm. long, ovate-oblong, obtuse, nerveless, hyaline; upper involuclral glume 4 mm. long, ovate-lanceolate,

acuminate, lower floral glume 6 mm. long, ovate-lanceolate, 5-nerved, awned, triandrous, the palea 5 mm. long, oblong, obtuse, often 2-fid, hyaline, upper floral glume 5 mm. long, membranous, ovate-lanceolate, 5-nerved, awned, palea 4 mm. long, lanceolate, acuminate, with involute margins, sometimes biaristulate at the tip.

Locality : *Sind*. Hyderabad (Woodrow !); Mirpurkhas (Mankad !).

Konkan Victoria Gardens, Bombay (McCann 4385 !).

Distribution : W Himalaya, Punjab, W Peninsula, Persia, Syria, Cilicia, Sinai, Egypt, Algeria

Explanation of Plate 114 : *Pennisetum orientale* Rich.

1. Lower invol glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, grain and styles.
8. Spikelets.
9. Bristles.

4. PENNISETUM PEDICELLATUM Trin.

PLATE 115.

Pennisetum pedicellatum Trin. in Mém. Acad. Pétersb. sér. 6, III, pt. II (1835) 184; Hook. f. Fl. Brit. Ind. VII (1896) 86; Cooke Fl. Bomb. II (1908) 916, Haines Bot. Bih. and Or. (1924) 986.

P. lanuginosum Hochst in Flora XXV (1842), Beibl. I, 133.

P. amoenum A. Rich. Tent Fl. Abyss. II (1851) 386.

P. intertextum Schlecht. in Bot. Zeit. IX (1851) 878.

Eriochaeta densiflora, nervosa et secundiflora Fig. & De Not. in Mem. Acc. Torin. ser. II, XIV (1854) 375-378.

Description : Annual, stems 30-90 cm. long, branched from the base and above, leafy. Leaves 15-25 cm. by 4-10 mm, flat, flaccid, glabrous or sparsely hairy; sheaths glabrous; ligule a shortly ciliate membrane.

Racemes cylindric, 5-12.5 cm. long, dense-flowered; rachis glabrous or nearly so, notched; involucre sessile, outer bristles few, slender, short, about 3 mm. long, inner bristles numerous, the longest reaching 10 mm. long (or more), densely villous below the middle, unequal, usually pale, free to the base. Spikelets 4 mm. long, usually solitary within the involucre, shortly pedicellate. Glumes 4; lower involucre glume very small, woolly; upper involucre oblong-lanceolate, apiculate, 4 mm. long, 7-nerved, hyaline, lower floral glume 3 mm. long, oblong, truncate, 3-toothed, 5-nerved, hyaline; upper floral glume ovate-oblong, obtuse, with a finely bristly ciliate tip, rather shorter than the lower floral glume, coriaceous, smooth, shining; palea as long as the glume, lanceolate, toothed.

Locality : *Gujarat* (Lasboas)

Kathnawar Rajkot (Woodrow).

Khandesh Toranmal, in watercourse (McCann 9868 !).

Deccan College Farm, Poona (Garade !).

Distribution : Bihar, Rajputana, W. Peninsula, tropical Africa.

Explanation of Plate 115 : *Pennisetum pedicellatum* Trin.

1. Spikelets.
2. Bristles.
3. Lower invol glume.
4. Upper invol glume.
5. Lower floral glume
6. Palea of lower floral glume with stamens.
7. Upper floral glume
8. Palea of upper floral glume.
9. Stamens, grain and styles.

5. PENNISETUM SETOSUM Rich.

Pennisetum setosum Rich. in Pers. Syn. I (1805) 72; Lasboas Bomb. Grasses (1896) 36; Hook. f. Fl. Brit. Ind. VII (1896) 87; Cooke Fl. Bomb. II (1908) 916, Haines Bot. Bih. and Or. (1924) 986.

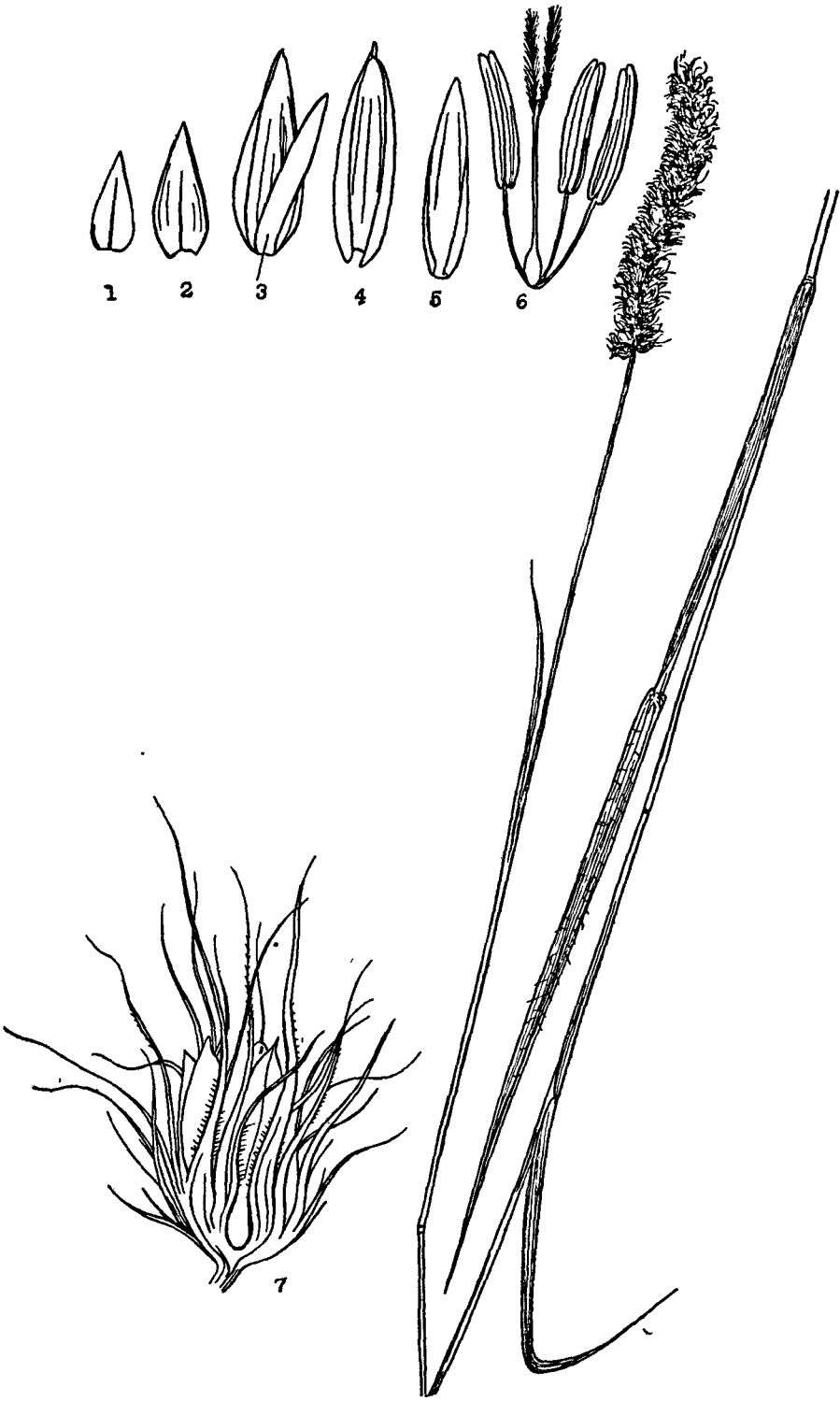
P. barbatum Schult. Mant. II, 147.

P. grave Nees Agrost. Bras. (1829) 283.



PENNISETUM PEDICELLATUM TRIN

Detin: E K Bide.



PENNISETUM CILIARE LINK.

- P. ciliatum* Parl. in Hook. Niger Fl. (1841) 184.
P. flavescens Presl Reliq. Haenk. I (1830) 316.
P. hirsutum Nees l c 284
P. holcoides Schult. l. c. 148, Duthie Grasses N. W. Ind. (1883) 10; Indig. Fodder Grasses (1886) t. 49, Fodder Grasses N. Ind. (1888) 17.
P. gracile Benth. in Hook. Niger Fl. l c. 564
P. myurus Parl. in Atti. Riun. Ott. Sc. Ital. 586.
P. polytachyum Schult. l. c. 146
P. purpurascens H. B. & K. Nov. Gen. & Sp. I (1816) 13.
P. Richardi Kunth Rev. Gram. I (1829) 49, 255, t. 39
P. Sieber Kunth Rev. Gram. l. c. 50.
P. triticoide Roem. & Schult. Syst. II (1817) 877.
P. unviflorum H. B. & K. l. c. t. 34.
Panicum Alopecurus Lam. Ill. I, 169, Encycl. IV, 739.
P. barbatum Roxb. Fl. Ind. I (1832) 282.
P. cenchroides Rich. in Act. Soc. Hist. Nat. Par. I (1792) 106.
P. densispica Poir. Encycl. Suppl. IV (1816) 273.
P. holcoides Roxb. l. c. 285.
P. polystachyum Schult. Mant. II, 146
P. triticoide Poir. l. c. 274.
Setaria cenchroides Roem. & Schult. Syst. II (1817) 495.
Cenchrus setosus Sw. Prodr. Veg. Ind. Occ. (1788) 26 (excl. syn.).

About the treatment of *Pennisetum setosum* by Leeks (Zeitschr. Naturw. 79 (1907) 17-19) see A. Chase, The North Amer. Species of *Pennisetum* in Contrib. U. S. Nat. Herb. 22 (1921) 222

Vernacular name : Sivati

Etymology : *Setosum* means provided with bristles.

Description : Annual, stem erect, often fastigiate branched at the nodes, green or purplish. Leaves 15-25 cm. by 6-10 mm., linear, finely acuminate, glabrous or hairy; sheaths glabrous, ligule a line fringed with rather long soft hairs.

Racemes 5-10 cm. long, usually purplish brown, rachis glabrous, notched; involucre sessile, bristles unequal, the outer not ciliate, short, about 3 mm. long, the inner longer, ciliate below the middle with long silky hairs (1 of the inner bristles is often much longer than the others, reaching 13 mm., the others 6-8 mm. long). Spikelets 4 mm. long, solitary within the involucre. Glumes 3 or 4, lower involucre glume minute or wanting; upper involucre glume 4 mm. long, ovate-oblong, gradually or suddenly cuspidate, 5-nerved, hyaline; lower floral glume 3 mm. long, oblong, obtuse, with 2 subobtusely lateral and an acute median tooth at the apex, 5-nerved, paleate, male, the palea 2.5 mm. long, narrowly oblong, hyaline; upper floral glume 2.5 mm. long, ovate-oblong, truncate, fimbriately ciliate at the tip, coriaceous, smooth and shining, palea as long as the glume, oblong, truncate, toothed or ciliate at the tip. Anthers nearly 2 mm. long. Styles long, reaching 3 mm., much exserted beyond the spikelet.

Our specimens from Khandesh have the bristles quite free from hairs

Locality : *Sind* Hyderabad (Woodrow)

Gujarat Ahmedabad, No. 6 grass plot Bhadar (Sedgwick ?).

Khandesh To Toranmal (McCann 9869 ?), Chansel Hill, S. slope (McCann 9867 ?)

Distribution : India (W. Bengal, Bihar, Upper Gangetic Plain, W. Peninsula), tropical Africa and America.

6 PENNISETUM CILIARE Link.

PLATE 116

Pennisetum ciliare Link. Hort. Berol. I (1827) 213, Boiss. Fl. Or. V (1881) 445; Aschers.-Schweinf. Ill. Fl. d'Ég. 161, no. 1132, Sickenberg Contrib. Fl. d'Ég. 301, Muschler Fl. Eg. I (1912) 65

Cenchrus ciliaris Linn. Mantiss. II (1771) 302; Desf. Fl. Atlant. II, 387

Pennisetum cenchroides Rich. in Pers. Syn. I (1805) 72; Beauv. Agrost. (1812) 59, t. 13, fig. 5; Atobias Cat. Panjab Pl. (1869) 162, Lisboa Bomb. Grasses (1896) 36, Duthie Grasses N. W. Ind. (1883) 10, Indig. Fodder Grasses (1886) t. 12, 13, Fodder Grasses N. Ind. (1888) 17, Cooke Fl. Bomb. II (1908) 916.

P. ciliare Link. Hort. Berol. I, 213.

P. distylum Guss. Ind. Sem. Hort. Booc. 8, Fl. Sic. Prodr. I, 12.

P. rufescens Spreng. Syst. Veg. I (1825) 302.

Cenchrus longifolius Hochst. ex Steud. Syn. Pl. Glum. 106.

C. rufescens Desf. Fl. Atlant. II, 387.

Panicum vulpinum Willd. Enum. Hort. Berol. 1031.

Vernacular name : Anjan dhaman.

Description : Perennial; stems tufted, 15-45 cm. long, erect or decumbent and much-branched from the base, stout or slender, leafy, or ascending from a branched often nodose rootstock. Leaves 10-25 cm. by 3-6 mm., linear, tapering to a fine point, glabrous or hairy.

Racemes cylindric, dense, 2.5-10 cm. by 8-13 mm., pale or purplish; rachis finely scaberrulous, involuclers subsessile; outer bristles slender, short, not ciliate; inner bristles about 10 mm. long (1 bristle conspicuously longer and stouter than the others, reaching 13 mm. long or more), dilated and connate into a ring at the base. Spikelets 4-5 mm. long, oblong-lanceolate, 3-1 in each involucler. Glumes 4; lower involucler glume 2-5 mm. long, ovate-lanceolate, acute, faintly 1-nerved, hyaline; upper involucler glume 3 mm. long, ovate, acuminate, 1-nerved, hyaline; lower floral glume 4-5 mm. long, ovate-lanceolate, cuspidately acuminate, 3-5-nerved, paleate, usually male, the palea narrowly lanceolate, as long as the glume, upper floral glume as long as the lower one, lanceolate, 3-5-nerved; palea lanceolate, as long as the glume.

Locality : Sind. (Burns !), Mirpurkhas (Mankad !, Sabnis B1043 !); Jacobabad (Deputy Commissioner !), Sanghar (Sabnis B892 !); Clifton near Karachi (Sabnis B805 !); Jemadar ka Landa, near Karachi (Stocks), Sehwan to Laki (Sabnis B620 !), Nasarpur (Sabnis B1056 !); Umarkot, sand dunes (Sabnis B1079 !), Tatta, Kullian Kote Lake (Blatter & McCann D630 ! D631 ! D633 !), Tatta (Blatter & McCann D632 ! D634 ! D635 !); Indus Delta (Blatter & McCann D636 !).

Cutch - Bhuj Hill (Blatter 3767 !).

Kathawar - Rajkot (Woodrow).

Gujarat - Nadiad (Chibber !), Dohad (Chibber !); Daman (Bhide !); Surat (Gammie !); Ahmedabad (Sedgwick !); near Madalpur, Ahmedabad (Saxton 1065 !).

Khandesh - Tapta bank, Muravat (Blatter & Hallberg 51651 !); Umalla, Tapti bank (Blatter & Hallberg 5208 !).

Deccan (Lisboa !).

S. M. Country - Gokak (Shevade !).

Ecology : Common in dry soil. Usually found in the drier parts of the Presidency.

Distribution : India (Kashmir, Upper Gangetic Plain, W. Peninsula, Deccan) throughout Africa, Sicily, Canaries.

Economic uses : An excellent fodder for horses and cattle. Believed to increase the milk of cows "In some parts of India it is credited in having the property of imparting a slightly intoxicating effect to the milk of buffaloes grazing on it." (Lisboa.)

Explanation of Plate 116 : *Pennisetum ciliare* Link.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume and palea.
4. Upper floral glume
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelets

*7. PENNISETUM SPICATUM Roem. & Schult.

PLATE 117.

Pennisetum spicatum Roem. & Schult. Syst. Veg. II (1817) 499.

Panicum spicatum Roxb. Fl. Ind. I (1832) 283.

Panicum spicatum Willd. Enum. Hort. Berol. 1037; Aitchis Cat. Panjab Pl. (1869) 163.

Holcus spicatus Linn. Syst. ed. X (1859) 1305, Grah. Cat. Bomb. Pl. (1839) 238; Dalz. & Gibs. Suppl. (1861) 99.

Pennisetum typhoides Rich. in Pers. Syn. I (1805) 72; Boiss. Fl. Or. V (1884) 447; Duthie Grasses N. W. Ind. (1883) 11, Field and Gard. Crops 30, t. 71, Fodder Grasses N. Ind. (1888) 18, Lisboa Bomb. Grasses (1896) 34, Hook. f. Fl. Brit. Ind. VII (1896) 82; Prain Beng. Pl. 1169; Cooke Fl. Bomb. II (1908) 917; Haines Bot. Bih. and Or. (1924) 985.

Panicum americanum Linn. Sp. Pl. I, 56.

Pennisetum americanum K. Schum. in Engl. Pflanzenw. Ost. Afr. B. (1895) 51; Hitchc. in Bailey Cyclop. Hortae. 2537.

Holcus racemosus Forsk. Fl. Aegypt-Arab. (1775) 175.

Alopecurus milica Burm. Fl. Ind. 27.

Pennisetum glaucum R Br Prodr. I (1810) 195.

In order to explain the above synonymy and the final adoption of the specific name *P. spicatum* we reproduce a MS. note kindly sent to us by Mr Hubbard.

"*Pennisetum typhodeum* L. Rich. in Pers Syn. i 72 (1805) has been changed to *Pennisetum americanum* by K. Schum in Engl Pflanzenw. Ost-Afr B. 51 (1895), based on *Panicum americanum* L. Sp. Pl. ed. i. 56 (1753). *Panicum americanum* L. in turn, is based on *Panicum americanum* Clusius Hist. cccv (1601). Hitchcock in Contr. U. S. Nat. Herb. xxii, 218 (1921) suggests that the figure (in Clusius) is that of the 'common millet' (*Setaria italica*) and that the description is based on more than one species. I do not think the figure is that of the 'common millet,' it is however very similar to a form of 'pearl millet' cultivated in Spain; in addition Clusius says that his *Panicum americanum* grows as tall as a man and has stouter, thicker stems than the common millet which he calls *Panicum vulgare* and figures on the same page. In the second edition of the Species Plantarum, 1484 (1763), Linnæus quotes *Panicum americanum* in synonymy under *Holcus spicatus* L. (first published in Syst. Nat. ed. x. n. 1305 (1759); this is the basis of *Pennisetum spicatum* Roem. et Schult. Syst. Veg. ii 499 (1817)). It appears advisable to use this name in preference to *Pennisetum americanum* K. Schum, owing to the uncertainty as to what *Panicum americanum* Clusius really is and also the name 'americanum' is misleading."

Vernacular names : Bulrush Millet, Cat-tail Millet, Pearl Millet, Bajri, Sajgure, Sejji, Bajhri, Bajra.

Etymology : *Spicatum* is derived from *spica*, spike, meaning spiked.

Description : Annual. Culms tall, erect, stout, terete, 0.9-1.8 m. high, rooting at the lower nodes, sometimes woolly, pubescent below the inflorescence. Leaves 30-90 cm. by 6-50 mm., linear to linear-lanceolate from a rounded base, acute, flat, more or less rough, glabrous, rarely hirsute, sheath terete, rather inflated, glabrous except the bearded nodes and the often villous junction with the blade, rarely hirsute, usually slightly rough, rather shorter than the internodes, ligule a narrow, long and densely ciliate rim.

Panicle spike-like, cylindric, very dense, 10-20 cm. long, often purplish, rhachis stout, villous, branchlets reduced to a peduncled involucrate cluster of 1-8 spikelets; peduncles villous, straight, 2.5-5 cm. long, often horizontally spreading or partly deflexed; involucre of very numerous ciliate often purplish bristles about as long as the spikelets. Spikelets sessile or shortly pedicelled within the involucre, readily deciduous when ripe, oblong, 5-6 mm. long, pale or purplish upwards. Lower involucral glume minute or 0, half-orbicular or subquadrate, 1-3-nerved; upper variable in length, sometimes absent, usually $\frac{1}{4}$ - $\frac{1}{2}$ the length of the upper floral glume, subquadrate, truncate, obtuse or retuse, 3-nerved, very rarely as long as the upper floral glume and coriaceous. Lower floral glume ovate-oblong, obtuse or truncate and apiculate, 5-nerved, epaleate or paleate, male or neuter, rarely bisexual, upper coriaceous or herbaceous, ovate, acute, 5-7-nerved, palea very broad, truncate, ciliate at the tip and dorsally, nerves 2, approximate, excurrent. Lodicules 0. Anthers linear, 2.5-3 mm. long, tips bearded. Styles connate. Grain oblong, obovoid, or pyriform, smooth, free, top exposed.

Locality : This kharif crop occupied in 1922-23 4,018,089 acres or about 20 per cent. of the grass cropped area in the Presidency. Ahmednagar claims about 20 per cent., Nasik 16.6 and Poona 14.25 per cent. These districts are followed by Sholapur, Satara, W. Khandesh, E. Khandesh and Bijapur, each of which grows 7-8 per cent. of the total area. Ahmedabad shows 3.9 and Kaira 3 per cent. The total area in Sind was 771,367 acres in 1922-23.

Ecology : Mollison says that it is entirely a rain crop, occupying the lighter description of soils in all districts of moderate rainfall. The crop does best when the climate is moderately dry and when the monsoon comes in downpours, with plenty of sunshine between the showers. It is nearly always a mixed crop, and as such may be grown continuously on the same land. But rotation is also frequent. A crop sown in early July will be ripe at the beginning of October.

Distribution : Cultivated in numerous forms in India, northern and tropical Africa.

Origin : Unknown. See Leeke, Untersuchungen über Abstammung und Heimat der Negerhirse.

Economic uses : The grain is used chiefly by the lower classes and in many parts it is their staple food.—The stalks and leaves are used as fodder for cattle, horses and sheep.—The ashes are used as an alkali in dyeing.

Diseases : See Butler in Mem. Dept. Agric. India II (1907) no. 1 and Maxwell Lefroy in Mem. Dept. Agric. India II (1908) no. 9.

Explanation of Plate 117 : *Pennisetum spicatum* Roem. & Schult.

1. Spikelets.
2. Part of anther.
3. Stamens

4. Lower invol. glume.
5. Upper invol. glume.
6. Lower floral glume.
7. Palea of lower floral glume.
8. Upper floral glume.
9. Palea of upper floral glume.
10. Stamens, ovary and styles.

*8. *Pennisetum purpureum* Schum. & Thonn.

Pennisetum purpureum Schum. & Thonn. Beskr. Guin. Pl. 44; Stapf in Kew Bull. (1912) 309.

P. macrostachyum Hook. Niger Flora 563.

P. Benthami Steud. Syn. Pl. Glum. I, 105.

P. nitens Hack. in Bol. Soc. Brot. VI (1888) 142.

Gymnothrix nitens Anders. in Peters Reise nach Mossamb. VI (1864) 552.

Pennisetum flexispica K. Schum. in Engl. Pflanzenw. Ost.-Afr. C (1895) 105.

Vernacular names : Elephant Grass, Napier's Fodder.

Description : Perennial. Rhizome creeping Culms erect, in tufts of up to 20, 2-3 m. or occasionally up to 7 m. high by 1.2-2.5 cm. diam. at the base, branches obliquely erect, terete, glabrous, smooth, excepting the upper part of the uppermost internode which is more or less hairy to tomentose, exserted parts sometimes covered with a glaucous bloom; nodes mostly exserted from the sheaths, all glabrous or most of them or only the uppermost with a ring of stiff, long, appressed hairs. Leaf-blade linear, inserted on the sheath with a very marked hinge-fold, tapering upwards to a fine point, 30-60, rarely to 90 cm. long by 2-5 cm. diam., with a strong midrib, rounded or the back with a shallow channel above towards the base, and in the larger leaves with 6 or 7 slightly prominent primary nerves on each side, dull green, sometimes slightly glaucous or tinged with purple, more or less rough on both sides, glaucous beneath, usually more or less hairy above, especially towards the base which sometimes becomes fringed, hairs fine, mostly rather stiff and long and often springing from small tubercles; margins spinulose scabrid. Sheaths terete, clasping the stem, striate, glabrous and smooth or pubescent to hirsute with tubercle-based hairs near the top. Ligule a narrow rim bearing a dense fringe of white hairs 2 or 3 mm. long.

Inflorescence a dense, cylindric, erect spike, 8-20 and even 30 cm. long and 1.5-3 cm. diam., yellow or tinged with brown, purple or quite blackish purple, made up of deciduous spikelets or fascicles of spikelets, each spikelet or fascicle surrounded by an involucre of numerous bristles of unequal length, most of them 5-8 mm. long, one usually very much longer (1.2-2 or exceptionally to 4 cm. long), scabrid, one or several of the innermost and longest sparingly plumose towards the base, rarely all naked, often dark yellow, brownish or purplish towards the tips or blackish-purple from the base. Spikelets sessile or if in fascicles of 2-4 the lateral pedicelled, all lanceolate, more or less acuminate, 5-7 mm. long, glabrous, straw coloured or tinged with brown or purple towards the tips of the florets, rarely blackish purple all over, hermaphrodite or, if fascicled, the lateral male, rarely neuter or all hermaphrodite. Lower involucral glume suppressed or quite rudimentary, upper ovate to ovate-lanceolate, acute, 0.5-1, rarely to 2 mm. long, subhyaline, 1-nerved or nerveless. Lower floral glume male or more often barren, lanceolate, acute or acuminate, half as long to almost as long as the upper glume, 3-nerved, rarely 1- or 5-, or even 7-nerved, palea linear-lanceolate, 2-nerved, shorter than the glume or in the barren florets reduced or suppressed; upper hermaphrodite or in the lateral spikelets male, lanceolate, acuminate or rostrate-acuminate, scaberulous upwards, usually 5-nerved, palea narrow, linear-lanceolate, slightly shorter than the glume, tips minutely 2-toothed. Lodicules 0. Anthers 2.5-3 mm. long, tips very minutely pectinate. Styles united throughout; stigmas very slender, up to 4 mm. long, exserted from the top of the floret. Mature grain unknown.

A most variable plant as can be seen from Stapf's description given above. He refrains from subdividing the species.

Locality : Imported into Bombay in 1915. Has been grown at several centres in W. India : Agricultural College Farm, Poona, the Governor's Dairy Farm, Ganeshkhund, the Sewage Effluent Farm A at Hadapsar in the Deccan, the Chharodi Cattle Farm in N. Gujarat and the Willingdon Cattle Farm near Karachi.

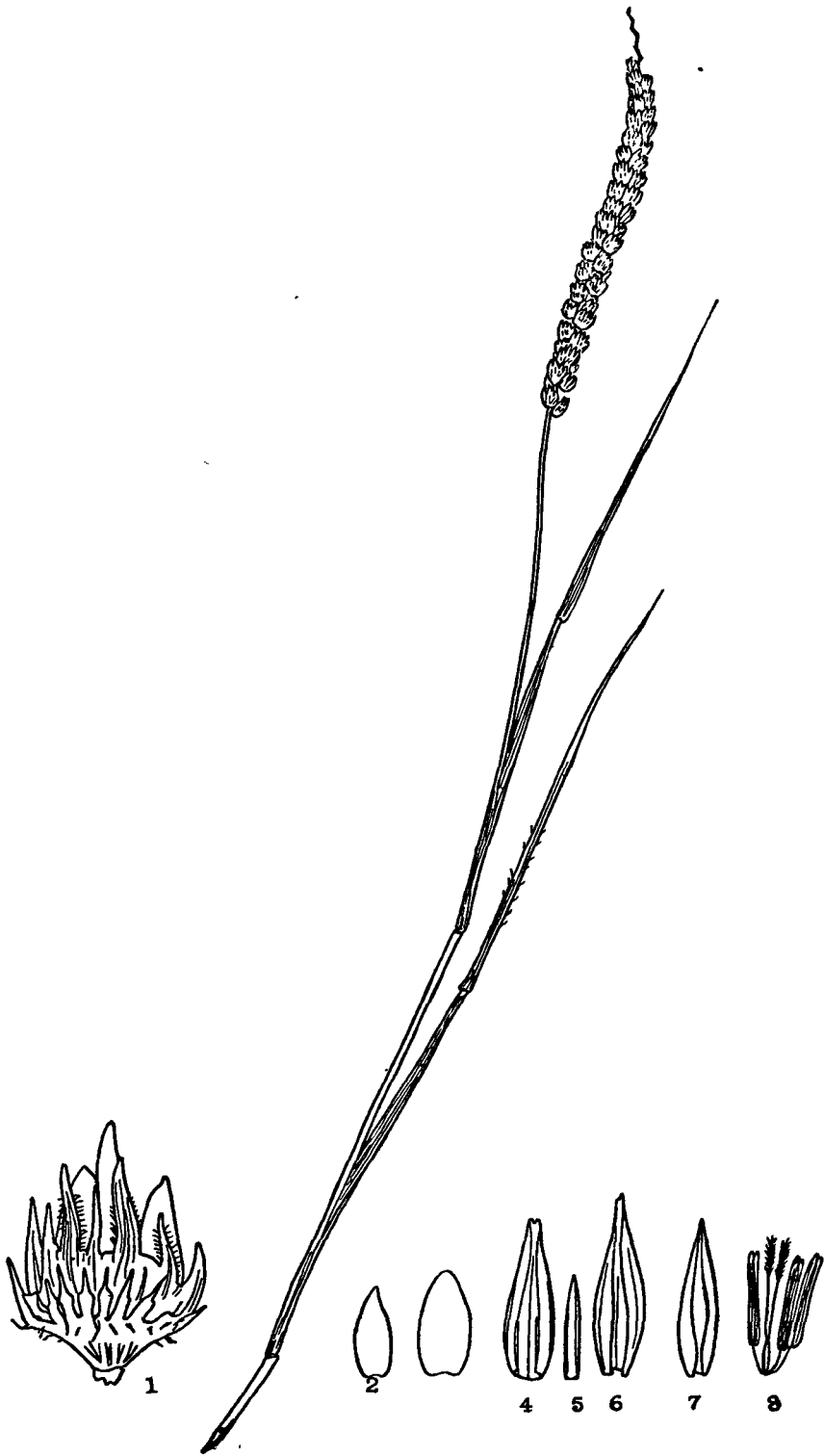
Distribution : Indigenous in tropical Africa between 10° N. Lat. and 20° S. Lat.

Economic uses : One of the best fodder-grasses. See Stapf Kew Bull. (1912), 313-316; H. H. Mann in Bull. 100 and 127 of the Dept. Agriculture, Bombay; Rhodesian Agric. Journ. VII (1910) 1398.



PENNISETUM SPICATUM ROEM. & SCHULT.

Desgn: B. K. Bhads.



CENCHRUS BIFLORUS ROXB.

Dehn: B. K.

61. *CENCHRUS* Linn.

Annual or perennial herbs. The inflorescences are spike-like racemes, consisting of involuclate clusters of shortly pedicellate spikelets jointed on a simple rhachis. Involucl consisting of hardened spike-like bristles, connate at the base into a short, coriaceous cup, which is surrounded by erect or squarrose bristles. Spikelets 1-3 in each involucl, mostly glabrous or nearly so, persistent, 1-2-flowered, with 3-4 glumes. Lower involuclal glume 1-nerved, usually narrow, sometimes wanting, upper involuclal glume and lower floral glume subequal, 5-7-nerved. Lower floral glume longer than the upper involuclal, with or without male flower, paleate. Upper floral glume coriaceous, with a hermaphrodite or female flower. Lodicules 2. Stamens 3. Styles 2, stigmas plumose. Grain broad, oblong, dorsally compressed, with a punctiform hilum, free within the glume and palea.

Species about 25 — Tropical and subtropical

- | | | | | | | |
|-------------------------------|---|---|---|---|---|----------------------------|
| 1. Base of involucl rounded | . | . | . | . | . | 1 <i>C. biflorus</i> |
| 2. Base of involucl turbinate | . | . | . | . | . | 2. <i>C. catharticus</i> . |

1. *CENCHRUS BIFLORUS* Roxb

PLATE 118

- Cenchrus biflorus* Roxb Fl Ind I (1832) 233, Lisboa Bomb Grasses (1896) 36 Dalz. & Gibs. Bomb. Fl (1861) 294, Duthie Grasses N W Ind (1883) 9, Cooke Fl. Bomb II (1908) 917, Acharyar S Ind Grasses (1921) 121
C. bulbifer Hochst ex Boiss Fl Or V (1884) 448
C. echanatus Wall Cat. no 8854 B. C
C. montanus Nees in Royle III Himal Pl (1839) 406 (nomen), Boiss l c, Duthie Grasses N W. Ind (1883) 9, Indig Fodder Grasses (1886) t 48, Fodder Grasses N Ind (1888) 16; Muschler Man Fl Egypt I (1912) 62
C. Schimper Hochst. ex Steud Nom ed 2, I (1840) 317
C. trysacoides Br in Salt Voy Abyss App 62 (nomen)

Vernacular names : Anjan, Dhaman

Etymology : *Cenchrus* is the Greek *kenchros*, a kind of millet — *Biflorus* means 2-flowered.

Description : Annual?, stem 15-60 cm long, simple. Leaves 7.5-25 cm by 3-10 mm, linear-lanceolate, finely acuminate, glabrous or hairy, sheaths glabrous or nearly so, ciliate near the mouth, ligule a pubescent ring.

Racemes 5-10 cm long, solitary, cylindric, rhachis angular, smooth, involucl usually 2-flowered, rounded at the base, bristles thick, lanceolate-subulate, erect, dorsally flattened, the outer very short, about 1.6-2.5 mm long, glabrous, the inner 3 mm long, glabrous or puberulous. Spikelets 4 mm long, subglobose. Glumes 4, lower involuclal glume 2.5 mm long, ovate, acuminate, very thin, hyaline, 1- (rarely 3-) nerved, upper involuclal glume 4 mm long, ovate, apiculate, 5-nerved, hyaline; lower floral glume scarcely shorter than the upper involuclal glume, ovate, acute, 5-7-nerved, paleate, the palea 3 mm long, oblong, obtuse, upper floral glume as long as the lower, ovate, obtuse. Anthers 2.5-3 mm. long. Styles free almost to the base. Grain 2 by 1.6 mm, orbicular-oblong, compressed, smooth, shining, pale brown.

Locality : Sind: Karachi (Woodrow), Jemadar ka Landa, near Karachi (Stocks), Jamesabad, in fields (Sabnis B1110 !), Umarnot, sandy plains (Sabnis B1081 !), Nasarpur, clayey soil (Sabnis B1051 !), Mirpur Sakro (Blatter & McCann D627 !), Tatta (Blatter & McCann D628 !).

Gujarat : Kharaghoda, under trees (Saxton 1064 !), Ahmedabad (Sedgwick !, Cooke); Morvi (Woodrow)

Khandesh : Bhusawal, Tapti (McCann 5154 !), Umalla, Tapti Bank (Blatter & Hallberg 5158 !); Kaperkhedo, Bori River (Blatter & Hallberg 4393 !)

Ecology : Generally growing in sandy soil

Distribution : Punjab, Rajputana, Gangetic Plain, W Peninsula, Baluchistan, Arabia, Nubia, Abyssinia

Economic uses : One of the nutritious of Indian grasses, and considered by some to be the very best (Duthie). The hay is good.

Explanation of Plate 118 : *Cenchrus biflorus* Roxb.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.

6. Upper floral glume.
7. Palea of upper floral glume.
- 8 Stamens, ovary and styles

2. *CENCRUS CATHARTICUS* Del.

PLATE 119.

Cenchrus catharticus Del Cat Hort Monsp (1838), Schlecht Linnaea XIII (1839); Litter (1839) 103, Duthie Indig Fodder Grasses (1886) t. XI, Fodder Grasses N. Ind (1888) 15; Boiss Fl Or V (1884) 448, Lisboa Bomb Grasses (1896) 37; Hook. f. Fl Brit. Ind VII (1896) 90, Cooke Fl Bomb II (1908) 918, Hitchcock & Chase in Contrib. U. S. Nat. Herb. XX (1920) 53, fig 8, Achariyar S Ind. Grasses (1921) 122.

C. annularis Anders in Peters Reise Mossamb Bot. (1864) 553.

C. echinatus A. Rich. Tent. Fl. Abyss II (1851) 389

C. nitotus Fig. & De Not in Mem. Acad. Torin. (1854) 380.

Elymus Caput Medusae Forsk. Fl. Aeg.-Arab. (1775) 25 (non Linn.).

Vernacular names : Bharont, Kukar.

Etymology : *Catharticus* is the Greek *katharticos* which signifies something that is efficacious in purging or purifying

Description : Quite glabrous; stems tufted, geniculately ascending, branched from the base, leafy. Leaves 2.5-12.5 by 3-6 mm, linear-lanceolate, finely acuminate, sheaths glabrous; ligule a hairy ring

Racemes 2.5-15 cm long, usually more or less enclosed in the uppermost leaf-sheaths; rachis angular, glabrous, flexuous, involucre with a turbinate base; bristles hard, subulate, sharply pungent, the outermost short, glabrous or nearly so, spreading or reflexed, the inner ciliate at the base, subulate, suberect or squarrosely spreading, dorsally grooved, reaching 10 mm. long. Spikelets shorter than the inner bristles. Glumes 4, lower involucre glume ovate-lanceolate, acute, hyaline, 2 mm long, upper involucre glume rather more than 4 mm long, 5-nerved, hyaline, lower floral glume ovate, acuminate, as long as the upper involucre glume, 5-nerved, paleate, hyaline, the palea 3 mm long, narrowly lanceolate, acute, hyaline; upper floral glume as long as the lower one, cuspidately acuminate, 5-nerved, membranous, palea ovate, acuminate, membranous, as long as the glume. Grain 2.5 mm long, ovoid-oblong, compressed, pale, rugulose

Locality : Sind Karachi (Burns !), Gharo (Blatter & McCann D629 !)

Cutch Sumrasar (Blatter 3762 !).

Gujarat Ahmedabad, sandy ground (Sedgwick !); Perim Island, at the mouth of the Narbada River (Rao!).

Khandesh Bor, Bori River (Blatter & Hallberg 5115 !).

Ecology : Growing mostly in sandy or arid soil. The burs when mature are readily attached by their spines to passing animals, the seed thus being widely distributed. The same may happen in the case of waterbirds

Distribution : Punjab, Gangetic Plain, W. Peninsula, Bellary, Nellore, Arabia, tropical Africa

Explanation of Plate 119 : *Cenchrus catharticus* Del.

1. Spikelet.
- 2 Lower invol glume
3. Upper invol glume
- 4 Lower floral glume.
- 5 Upper floral glume
- 6 Palea of upper floral glume.
- 7 Filaments, ovary and styles.

62. *ISACHNE* R. Br.

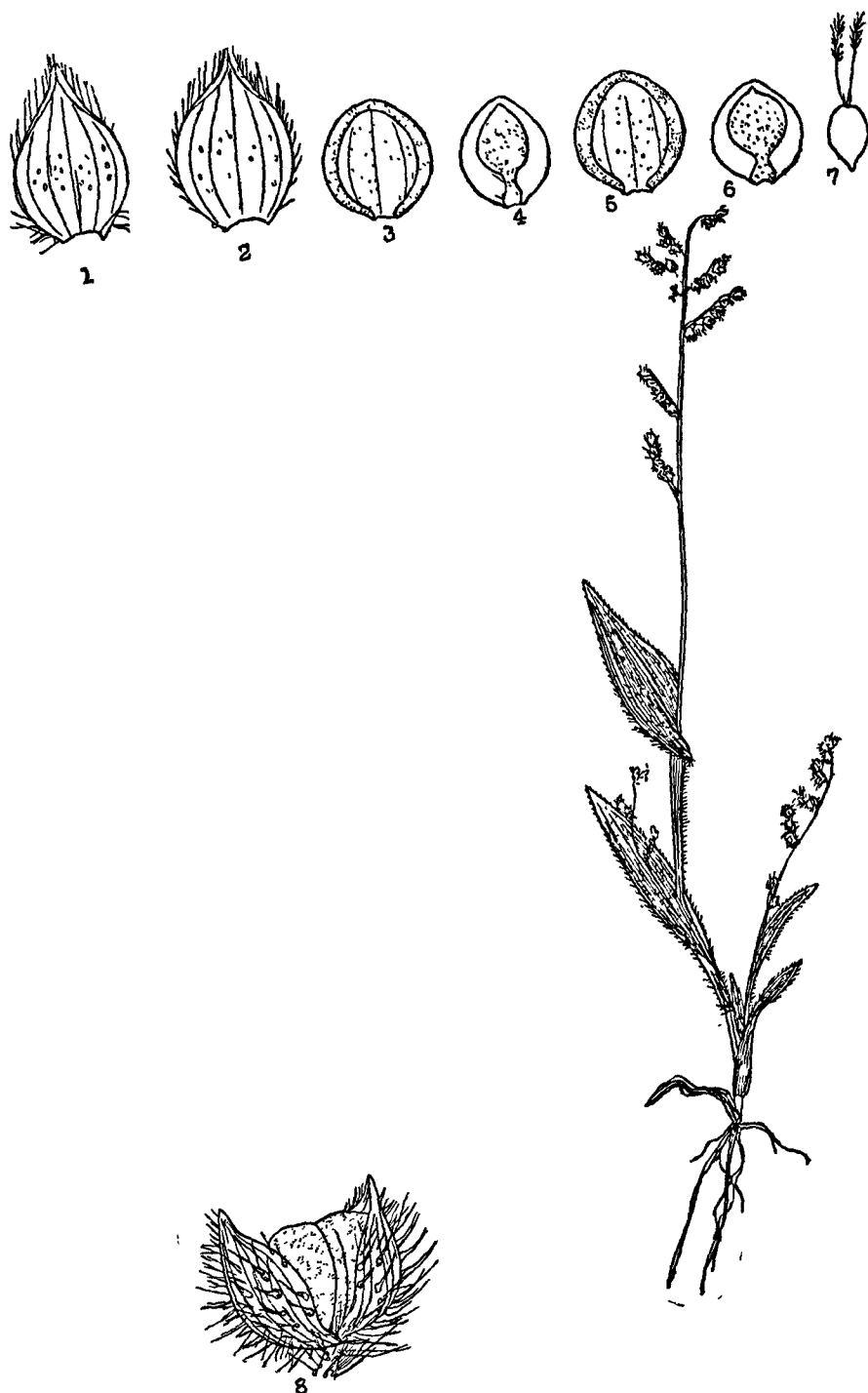
Perennial grasses. Leaves ovate or linear-lanceolate.

Spikelets small or minute, loosely paniculate, not or obscurely articulate with the pedicel, subglobose or obovoid, 1-2-flowered. Glumes 4, the 2 lower often separately deciduous, thinly coriaceous or membranous, strongly nerved, involucre glumes subequal, convex, empty; the 2 floral glumes both paleate, equal and convex, or the lower larger and flatter; lower floral glume male or neuter, upper floral glume jointed and often stipitate on the very short rachilla, hemispheric, female or hermaphrodite. Lodicules most minute. Stamens usually 3 (rarely 4 or 6). Styles 2, free; stigmas short, plumose, exerted at the top of the spikelet. Grain free within the hardened glume and palea.



CENCHRUS CATHARTICUS DEL

Dehn: B. K. Bl.de.



ISACHNE LISBOAE HOOK. F.

Desin: B. E.

For discussion of the genus see : Chase, Genera Paniceae, IV. Proc. Biol. Soc. Washington 24 (1911) 149 and Hitchcock, North Americ Species of *Isachne* in Contrib. U S. Nat. Herb. 22 (1920) 115.

Species about 30.—Tropical and subtropical regions.

- A. Involucral glumes longer than the floral glumes . . . 1. *I. Lisboae*
 B. Involucral glumes about equalling the floral glumes. . . .
 I Floral glumes equal and similar, both hemispheric and coriaceous . . . 2. *I. elegans*.
 II. Floral glumes usually unequal, the lower floral glume thin, flat, often longer than the upper.
 a. Stem reaching 45 cm long, panicle rather large, ovoid or pyramidal, spikelets 2 mm long; leaves 2.5-6.3 cm long . . . 3 *I. australis*.
 b. Stem rarely reaching 25 cm long, panicle small, lax-flowered, spikelets 1.2-1.6 mm. long, leaves 2.5-3.8 cm. long . . . 4 *I. mulsacea*.

1. *ISACHNE LISBOAE* Hook f

PLATE 120

Isachne Lisboae Hook. f Fl Brit Ind VII (1896) 22, *Lisboa* Bomb. Grasses (1896) 6; Cooke Fl. Bomb. II (1908) 922

Etymology : *Isachne* is derived from the Greek *isos*, equal and *achne*, a glume, alluding to the equal glumes

Description : A low plant 15 cm high, stems creeping with long wiry roots, then ascending, rather stout leafy. Leaves 2.5-5 cm by 17 mm, recurved, thin, oblong-lanceolate, acute, ciliate on the margins with long slender hairs, closely and conspicuously nerved, sheaths glabrous or sparsely hairy, ligule 0.

Panicles 2.5-5 cm long; branches of the panicle (spikes) 13-20 mm long, horizontally spreading. Spikelets 2.5-3 mm diam, secund on the lower side of the branches, hairy with bulbous-based hairs, pedicels short, triquetrous, hairy. Glumes 4; lower and upper involucral glumes equal, broadly ovate or suborbicular, acuminate, conspicuously 5-nerved, longer than the floral glumes, hairy, floral glumes orbicular, equal, smaller than the involucral glumes, concave, glabrous. Palea with incurved flaps.

Locality : *W Ghats* Mahabaleshwar, 4,000 ft., rainfall 270 in (Sedgwick & Bell 4581 !), Fitzgerald Ghat (Woodrow !), common near lake (McCann !), Panchgani, First Tableland (Blatter & Hallberg !), very common on Tableland (McCann !)

Ecology : This species is very local, inhabiting apparently only the Panchgani and Mahabaleshwar plateaux. Very common at Mahabaleshwar in damp places with stems spreading, hardly ascending. It is subgregarious. When growing in water the plant is erect and leafless to the waterline, while the habit is prostrate in marshes and drier soil. There appears no difference of colour between the inflorescence and the rest of the plant.

Distribution : Endemic

Explanation of Plate 120 : *Isachne Lisboae* Hook. f.

1. Lower invol. glume
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume
5. Upper floral glume.
6. Palea of upper floral glume.
7. Grain and styles.
8. Spikelet.

2. *ISACHNE ELEGANS* Dalz.

PLATE 121

Isachne elegans Dalz. in Dalz. & Gibs. Bomb. Fl. (1861) 291; *Lisboa* Bomb. Grasses (1896) 7; Hook f. Fl. Brit. Ind. VII (1896) 23; Cooke Fl. Bomb. II (1908) 923.

Vernacular name : Doonda.

Description : A small elegant grass 20-30 cm high; stems densely tufted, soft, geniculate below, and with slender fibrous roots. Leaves 5-15 cm. by 4-6 mm, linear-lanceolate, acute,

strate, with thickened and glabrous or minutely serrulate margins; sheaths bristly at the mouth.

Panicle 7.5-12.5 cm long, glabrous, branches slender, alternate, undulating, 1.3-2.5 cm. long, smooth; pedicels short, glabrous. Spikelets 2.5-3 mm. diam., hispid, with 2 perfect flowers. Glumes 4; involucrel glumes equal, similar, inconspicuously many-nerved, broadly ovate or suborbicular, with red margins, hairy, floral glumes as long as the involucrel glumes, hemispheric, puberulous. Anthers 1.6 mm. long, brownish yellow.

We have found specimens reaching the following dimensions: Stem 90 cm.; leaves 25 by 1 cm., or broader, sparingly hairy or almost villous; panicle 25 by 15 or more cm.

Locality: *Konkan* Pen, in mundated land (Dalzell).

W. Ghats Lonavla (Woodrow 175); Khandala, behind hotel (McCann 9555 !); Mahabaleshwar, 4,000 ft, rainfall 270 in (Sedgwick & Bell 4583 !); Panchgani, Tableland, forming large patches (Blatter 5080 !).

Deccan Margins of rivulets in the Deccan (Dalzell & Gibson); *Sinhagad forests* (Bhide !); Nasrapur to Purandhar (Bhide 1001 !); Purandhar, north foot (McCann 5048 !); Lohagad Fort, top (McCann 9560 !); Ganeshkhind Gardens (Herb. Econ. Bot. Poona !); between Poona and Karh (Jacquemont 556).

S. M. Country: Dharwar, rice fields, 2,500 ft. (Sedgwick 1829 !).

N. Kanara. Halyal, ricefields (Talbot 2305 !).

Ecology: Usually forming large mats in moist soft soil, and then not growing very tall; also on margins of streams.

Distribution: Endemic.

Explanation of Plate 121: *Isachne elegans* Dalz.

1. Lower invol glume.
2. Upper invol glume
3. Lower floral glume with palea, filaments, ovary and styles.
4. Upper floral glume with palea, filaments, ovary and styles.
5. Spikelet.

3. *ISACHNE AUSTRALIS* R. Br.

PLATE 122.

Isachne australis R. Br. Prodr. (1810) 196; Lisboa Bomb. Grasses (1896) 7; Hook. f. Fl. Brit. Ind. VII (1896) 24, Cooke Fl. Bomb. II (1908) 923.

I. atro-virens Trin. Gram Panic 251.

I. lepidota Steud. in Flora XXIX (1846) 19.

Panicum antipodum Spreng Syst I (1825) 314

P. atro-virens Trin. ex Spreng. Neue Entdeck. II, 88.

P. australis Rasp. in Ann. Sc. Nat. V (1825) 299.

P. lepidotum Steud. in Flora XXIX (1846) 19

P. notibarbatum Hochst. Pl. Hohenack no. 127.

P. violaceum Kleme ex Thiele in Linnaea IX (1834) 307.

Ara ischaemoides Koen. ex Kunth Enum. Pl I (1838) 307.

Milum globosum Thunb. Fl. Jap. (1784) 49.

Vernacular names: Doaris, Dauria

Etymology: *Australis* means southern.

Description: Stem slender, erect or ascending from a creeping rootstock, 20-45 cm. high, leafy, smooth, branched below; nodes glabrous. Leaves 2.5-6.3 cm. by 4-8 mm., linear-lanceolate, acuminate, flat, multistriate, scaberulous on both surfaces, base rounded; sheaths 2-3.8 cm. long, strate, the margins above the middle densely ciliate; ligule a tuft of long slender erect white hairs

Panicle 2.5-10 cm long; branches alternate, flexuous, erect or spreading, up to 3.8 cm. long, sometimes divided; rachis angular, smooth. Spikelets 1.6-2 mm. diam., globose, sessile or pedicellate, green or violet, pedicels sometimes 6 mm. long, capillary. Glumes 4; involucrel glumes similar, broadly ovate or suborbicular, obtuse, concave, membranous, 7-nerved, glabrous or with a few bristles; floral glumes usually unequal, the lower longer and thinner than the upper, ovate, obtuse, nerveless; upper floral glume hemispheric, coriaceous, ciliolate. Palea glabrous. Anthers 1.6 mm. long, red.

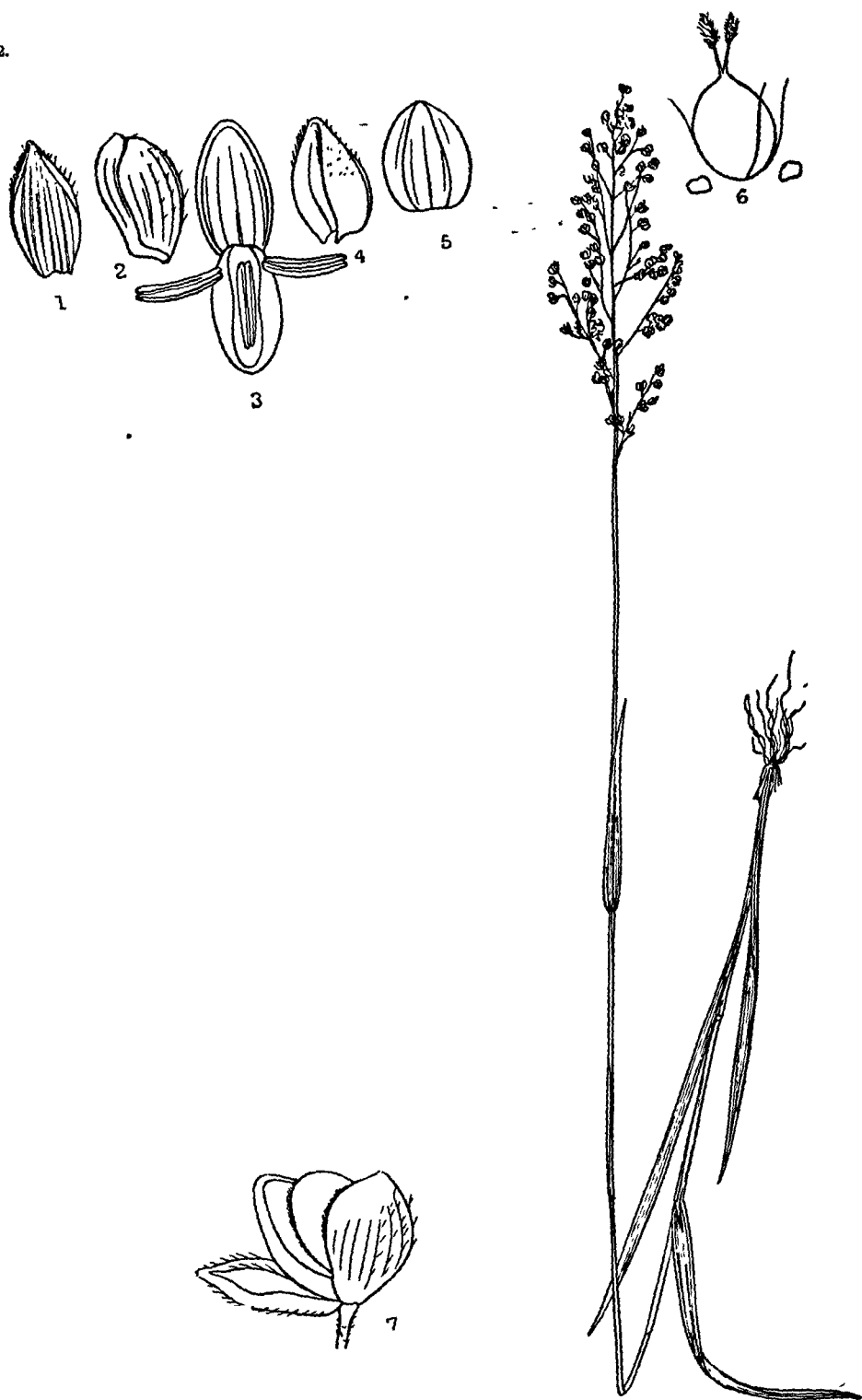
Locality: *Gujarat* (Lisboa).

Konkan: Nagotna, in dry plains (Gammie 16064 !), Kharda (Ryan 565 !); Bhandup (McCann 9841 !); Matunga to Mahim (McCann 9842 !); Andheri (McCann 5129 !);



ISACHNE ELEGANS DALZ.

Deskn. R K Bhids.



ISACHNE AUSTRALIS R. BR.

Trin. & R.

Sion (McCann 5244 !), Pen (McCann 5390 !); Alibag, ricefields (Ezekiel !); Mulgaum, tank (McCann 5103 !).

W Ghats: Matheran, Charlotte Lake (D'Almeida A247 !); Khandala, common (McCann 9840 !), Sakarpathar, Lonavla (Gammie 15961 !), Igatpuri (Blatter & Hallberg 4308 !); Mahabaleshwar (Woodrow), Londa (Bhide !)

Deccan - Poona (Lisboa); Nasik (Lisboa).

S M Country - Dharwar Dist., ricefields, 1,800 ft., rainfall 35 in (Sedgwick 3737 !), Kunnur, marshes, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4935 !).

N Kanara - Karwar (Bell !), Gohann (Herb. Econ. Bot. Poona !), Halyal (Talbot 2160 !), Sirsi to Siddhapur (Hallberg & McCann A19 !), Yellapur (Talbot 1521 !); Kadgal (Herb. Econ. Bot. Poona !).

Ecology: A subgregarious species. Very common in marshy land in the Carnatic. Grows in fields and is detrimental to crops.

Distribution: All over India, Australia, New Zealand.

Economic uses: Said to be eaten by cattle and horses.

Explanation of Plate 122: *Isachne australis* R. Br.

- 1 Lower invol. glume.
2. Upper invol. glume.
- 3 Lower floral glume with palea and stamens.
- 4 Upper floral glume.
- 5 Palea of upper floral glume
- 6 Grain, filaments, styles and lodicules.
7. Spikelet.

4. ISACHNE MILIACEA Roth.

PLATE 123.

Isachne miliacea Roth Nov Pl Sp. (1821) 58, Lisboa Bomb. Grasses (1896) 8; Hook. f. Fl.

Brit Ind. VII (1896) 25, Cooke Fl. Bomb. II (1908) 923.

I. Menertiana Poir. Encycl. Suppl. III, 185 (excl. syn.)

I. minutula Kunth Rev. Gram. II (1829) t. 117.

I. adstans Miq. Fl. Ind. Bot. III, 461.

I. polygonoides Doell in Mart. Fl. Bras. II, II, 273.

I. geniculata et stigmatosa Griff. Not. III, 41, 42; Ic. Pl. Asiat. t. 139, f. 206, t. 148, fig. 2.

Panicum aequatum Nees ex Steud. Syn. Pl. Glum. 98

P. adstans Steud. l. c. 94.

P. Benjamin Steud. l. c. 96

P. Menertiana Spreng. Syst. I (1825) 321.

P. minutulum Gaud. in Freye Voy. Bot. 410.

P. polygonoides Lam. Encycl. IV, 748

P. patens Roxb. Fl. Ind. I (1832) 305.

P. gonatodes Steud. l. c. 95

Neurachne Menertiana Roem. & Schult. Syst. II (1817) 475 (excl. syn.).

Vernacular name: Swamp Millet.

Etymology: *Miliacea* is derived from *mihum*, millet.

Description: A slender plant, variable in size, 15-25 cm high, stems very slender, prostrate, widely creeping and branched below, then ascending. Leaves small, rather distant, 1.3-3.8 cm by 3-8 mm, ovate, acute, glabrous or sparsely hairy, base rounded.

Panicle small, lax-flowered. Spikelets 1.2-1.6 mm. diam., globose, few and distant; pedicels short or long, capillary. Involucral glumes orbicular-oblong, almost hemispheric, often hispid with long hairs, obscurely 7-nerved; lower floral glume rather longer than the upper, ovate-oblong membranous, male; upper floral glume smaller, hemispheric, coriaceous, female. Palea glabrous.

Locality: *Konkan* (Woodrow).

W. Ghats - Lonavla (Woodrow); Mahabaleshwar, in forests, fairly common in one spot (McCann !), Panchgani (McCann !).

N. Kanara: Sulgeri, 500 ft., rainfall 200 in (Sedgwick & Bell 4248 !); Yellapur (Talbot 1521 !); Garsoppa Falls, Mysore side (McCann & Hallberg A23 !).

Ecology: Likes shady pasture ground. A monsoon species.

Distribution: More or less throughout India, Ceylon, China, Malay and Pacific Islands, S. America.

SUBFAMILY II: POOIDEAE.

Mature spikelets breaking up, leaving the persistent or subsistent involucrel glumes on the pedicel, or if falling entire, then not consisting of 2 heteromorphous florets as in *Panicodeae*.

TRIBE IV: Arundinelleae.

Florets 2, heteromorphous, the lower awnless or barren. Rhachilla not continued beyond the upper floret. Lower floral glume awnless, rather resembling the involucrel glumes; upper generally awned, at length firm or hard, awn from the sinus between 2, sometimes minute or bristle-like lobes, rarely from the entire, obtuse tip, usually kneed and twisted below the knee.

See key page xvii.

63. ARUNDINELLA Raddi.

Perennial or annual erect grasses. Leaves narrow.

Spikelets paniculate, continuous with or imperfectly jointed on the pedicels; rhachilla not produced beyond the upper floret. Glumes 4, membranous, chartaceous or thinly coriaceous, involucrel glumes acute or acuminate, 3-5-nerved, the upper usually the longer; lower floral glume equalling the lower involucrel glume or slightly longer, 3-7-nerved, paleate, male or neuter (rarely 2-sexual), upper floral glume much shorter than the lower one, thin, 2-sexual (or sometimes ? female), entire or minutely 2-fid, 3-7-nerved, awnless or 1-3-awned (if 3-awned, the 2 lateral awns bristle-like, straight, the median awn geniculate). Paleae of floral glumes linear or oblong, 2-keeled, flaps more or less auricled. Lodicules 2, minute. Stamens 3, anthers linear-oblong. Styles 2, distinct, stigmas short, laterally exerted. Grain oblong to ellipsoid, free within the upper floral glume and palea.

Species about 55. In the tropics.

Cooke describes 12 species from the Bombay Presidency. We retain them all except that we change *A. agrostoides* Trin. into *A. ciliata* Nees, *A. brasiliensis* into *A. hispida* O. Ktze. and *A. capillaris* into *A. mutica* Nees.

To the 12 species we add another. *A. villosa* Wight & Arn.

A. Upper floral glume with 3 awns.

I. Leaves less than 10 cm. long. Annuals.

1. A straggling grass. Leaves glabrous or sparsely hairy 1. *A. avenacea*.
2. An erect grass. Leaves hispid with bulbous-based hairs 2. *A. tuberculata*.

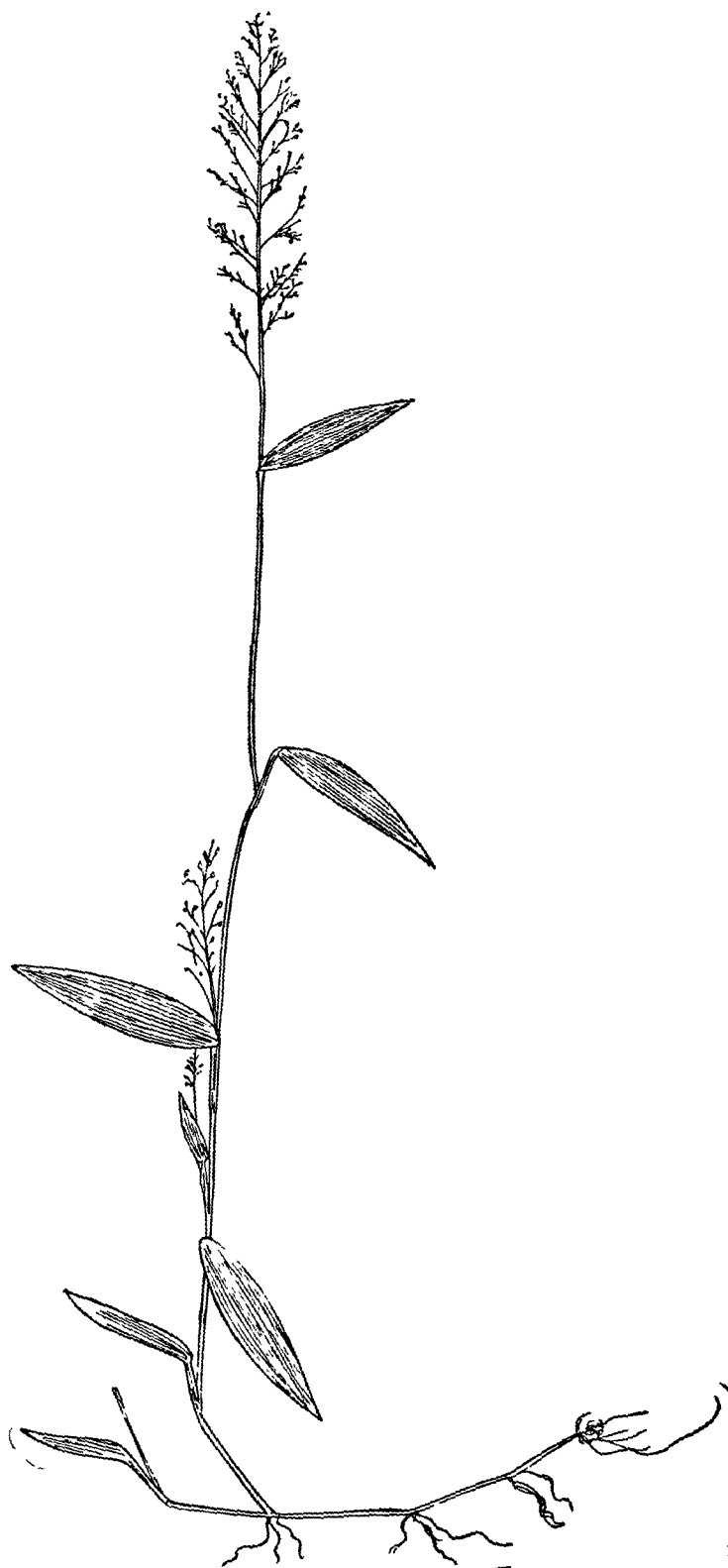
II. Leaves 15-30 cm. long. Perennials 3. *A. setosa*.

B. Upper floral glume with 1 awn.

I. Spikelets 1.5-2 mm. long 4. *A. tenella*.

II. Spikelets 2.5-3 mm.

1. Stem scarcely 15 cm. high. Leaves 2.5-4 cm. long 5. *A. pygmaea*.
2. Stem exceeding 15 cm.
 - a. Stem reaching 45 cm. Leaves 2.5-10 cm. long, they and the sheaths clothed with long soft hairs 6. *A. ciliata*.
 - b. Stem reaching 90 cm. Leaves 10-15 cm. long; they and the sheaths glabrous or nearly so 7. *A. Metzm.*
 - c. Stem reaching 1.2 m. Leaves 20-30 cm. long; sparsely hairy, sheaths glabrous or nearly so 8. *A. Lawii*.



ISACHNE MILIACEA ROTH.

Desm: B. K. B. Mide



ARUNDINELLA AVENACEA MUNRO.

Delin: E. K. Bhud

III. Spikelets 4-6 mm. long.

1. Panicle branched.

- a. Rootstock hard, creeping, not tuberous
Rhachis of panicle angular, glabrous . 9. *A. hispida*.
b Rootstock tuberous. Rhachis of panicle
filiform, scaberulous . 10 *A. nutra*.

2. Panicle spicate

- a Leaves 2.5-4 cm long . . . 11 *A. spicata*.
b Leaves 10-20-30 cm long . . . 12. *A. villosa*

- C. Upper floral glume without awn 13 *A. gigantea*.

1 ARUNDINELLA AVENACEA Munro.

PLATE 124.

Arundinella avenacea Munro ex Thw Enum. Pl. Ceyl (1864) 362, Hook. f. Fl. Brit. Ind. VII (1896) 69, Cooke Fl Bomb II (1908) 1000 (*arenacea per err*).

A. Campbelliana Lisboa in Journ Bomb Nat Hist. Soc V (1891) 346.

A. malabarica Heyne ex Hook f. Fl. Brit. Ind. VII (1896) 69.

Ara No 3, Griff. Notul III, 55, Ic Pl. Asiat. t 146, fig. III

Etymology : *Arundinella* is a diminutive of *arundo*, a reed.—*Avenacea* is derived from *avena*, oats

Description : An annual weak straggling slender grass, stems ascending, leafy, 15-30 cm. long, rooting at the lower nodes; nodes glabrous. Leaves 2-5 cm. by 6-10 mm., ovate-lanceolate, acute, flat, glabrous or sparsely hairy, strongly nerved, from an amplexicaul pectinately ciliate 2-auricled base, sheaths glabrous, the margins naked or ciliate in the upper part; ligule linear, small, membranous

Panicle 1.3-2.5 cm long, ovoid-oblong, compact, branches very short Spikelets 4 mm. long (excluding the awns). Glumes 4, involucrel glumes distant at the base, 3-5-nerved, membranous, lower involucrel glume 4 mm long (including awn), lanceolate, acute narrowed into a scaberulous awn, upper involucrel glume rather longer, notched at the tip, with a long scaberulous awn in the sinus, lower floral glume shorter than the upper involucrel glume, oblong, obtuse, dorsally mucronate, paleate, neuter or male, the palea oblong-obovate, 2-fid at the apex, upper floral glume 2-sexual or female, shorter than the upper involucrel glume, oblong, membranous, with 2 lateral tufts of white hairs, divided at the apex into 2 triangular lobes from each of which slender capillary awns issue; median awn about 10 mm long, the lower half brown, twisted, the upper half gemiculate, pale, scabrid, subulate, palea linear-oblong, 2-fid at the apex

This grass in its young state resembles *A. spicata* so much that it can easily be mistaken for that species

Locality : Konkan Ratnagiri (Woodrow)

W. Ghats Khandala, very common (McCann 9604 !); Tiger's Leap, near Lonavla (Woodrow), Mahabaleshwar, very common, 4,500 ft., rainfall 270 in (Sedgwick & Bell 4510 !, Lisboa), Panchgani (Blatter 5383 !), Tiger's Path (Blatter & Hallberg B1255 !); Castle Rock (McCann 9854 !, Woodrow, Bhide !)

S. M. Country Ram Ghat (Ritchie 890).

N. Kanara. Anmod, 1,800 ft, rainfall 200 in. (Sedgwick 3253 !), Tinai Ghat, 1,800 ft, rainfall 250 in (Sedgwick 3269 !); Yellapur (Talbot 1035 !), Supa (Talbot 2487 !); Kumberwada (Talbot 2255 !), Karwar (Talbot 1302 !); Katgal (Hallberg & McCann A165 !); Devmane (McCann 9936 !).

Ecology : A subgregarious grass Very common in Kanara forests. A species of open grass-land but also in rocky situations

Distribution : Khasia, Burma, W. Peninsula, Ceylon.

Explanation of Plate 124 : *Arundinella avenacea* Munro.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Stamens.
7. Upper floral glume.
8. Palea of upper floral glume, with stamens, ovary and styles.

2. *ARUNDINELLA TUBERCULATA* Munro.

PLATE 125.

Arundinella tuberculata Munro ex Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1891) 344; Hook. f. Fl. Brit. Ind. VII (1896) 69; Cooke Fl. Bomb. II (1908) 1000; Janowski in Bot. Archiv I (1922) 24.

Etymology : *Tuberculata* means that the plant is beset with tubercle-based hairs.

Description : Annual; stem erect or slightly decumbent at the base, 30-45 cm. high, glabrous. Leaves 2.5-9 cm. by 4-13 mm., linear-lanceolate, acute, hispid with white bulbous-based hairs, base rounded; sheaths reaching 5 cm. long, hispid with long white bulbous-based hairs; ligule a ridge of hairs.

Panicle 7.5-15 cm. long, narrowly oblong; rachis angular; branches 1.3-2.5 cm. long, scaberulous. Spikelets ovoid, acute, pedicellate, single or geminate, 4 mm. long (excluding awns), clothed with long bulbous-based hairs. Glumes 4; lower involucre glume 4 mm. long (including an awn of about 1 mm. long), 3-nerved, with bulbous-based hairs along the nerves, subcoriaceous, upper involucre glume 4 mm. long (excluding the beak), ovate, acute, 5-nerved, with bulbous-based hairs along the nerves, narrowed into a beak as long as the body of the glume, subcoriaceous, lower floral glume rather more than 4 mm. long, elliptic-oblong, obtuse, 2-fid, glabrous, subcoriaceous, with incurved margins, paleate, male, the palea as long as the glume, oblong-lanceolate, acute; upper floral glume rather more than 2.5 mm. long, lanceolate, acute, when ripe subcoriaceous, brown and scabrid, median awn reaching 13 mm. long, the lower half brown, twisted or not, the upper half straight, whitish, scaberulous; lateral awns acicular, transparent, 2-2.5 mm. long.

Locality : *Konkan* : Vasco da Gama (Bhide!).

W. Ghats : Panchgani, slopes below Third Tableland (Blatter & Hallberg 1232!); *Pasarni Ghat* (Blatter & Hallberg 1306!).

Deccan : Poona (Woodrow).

S. M. Country : Dry hills between Yelvig and Savanur, 1,900 ft., rainfall 25-30 in. (Sedgwick 1959!).

N. Kanara : Manoh (Talbot 3979!); Jog to Siddhapur, open grass-land, rocky soil (McCann 9856!), Katgal, open grass-land (Hallberg & McCann A164!); Karwar, open grass-land (Hallberg & McCann A163!).

Ecology : A subgregarious plant. Grows in dry watercourses on barren uplands in the centre of the Dharwar District. This is the only species of *Arundinella* which inhabits the drier tracts.

Distribution : Central India, W. Peninsula.

Explanation of Plate 125 : *Arundinella tuberculata* Munro.

1. Spikelet
2. Lower invol. glume
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume and stamens.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

3. *ARUNDINELLA SETOSA* Trin.

PLATE 126

Arundinella setosa Trin. Gram. Panic. (1826) 63; Hook. f. Fl. Brit. Ind. VII (1896) 70; Cooke Fl. Bomb. II (1908) 1001; Duthie Grasses N. W. Ind. (1883) 13; Janowski in Bot. Archiv I (1922) 24.

A. hirsuta Nees ex Steud. Syn. Pl. Glum. 115; Hohen. Pl. Ind. Or. no. 920.

A. stricta Nees in Hook. Kew Journ. II (1850) 102; Dalz. & Gibs. Bomb. Fl. (1861) 292.

Vernacular names : Turdia, Kotir.

Description : Perennial; stem 30-90 cm. high, erect from a hard rootstock, slender, rigid, subtuberous at the base, nodes glabrous. Leaves 15-30 cm. by 3-6 mm., linear, finely acuminate, glabrous, pubescent or sometimes hispidly hairy; sheaths glabrous; ligule very small.

Panicle 7.5-25 cm. long, lax. branches 5-12.5 cm. long, distant, suberect, filiform. Spikelets (including the mucro of the upper involucre glume) reaching 6 mm. long (or more). Glumes 4; lower involucre glume 6 mm. long, ovate-lanceolate, aristately acuminate, 3-nerved, hairy or almost glabrous; upper involucre glume rather more than 6 mm. long, oblong-lanceolate, narrowed into a long awn with truncate tip, 5-nerved; lower floral glume 5 mm. long.



ARUNDINELLA TUBERCULATA MUNRO.

Desm: R. K. Bhode.



ARUNDINELLA SETOSA TRIN.

Detm: E. K. B.

obtuse, paleate, male, the palea 3 mm. long, oblong-lanceolate, subacute, upper floral glume 3 mm. long, ovate-lanceolate, acuminate, 2-sexual; palea as long as the glume, narrowly oblong-lanceolate, subacute; median awn more than 6 mm. long, brown below, pale above; lateral awns capillary, 1.2 mm. long.

Locality : *Konkan* Near Bombay (Ritchie).

N. Kanara Dandeh (Talbot 2266 !); Gersoppa Falls, on rocks in riverbed (McCann A166 !).

Distribution : W. Himalaya, Khasia Hills, Bihar, Central India, Nilgiris, Ceylon, Tonkin, China, Philippines.

Economic uses : Not eaten by cattle.

Explanation of Plate 126 : *Arundinella setosa* Trin.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

4. ARUNDINELLA TENELLA Nees & Wight.

PLATE 127.

Arundinella tenella Nees & Wight ex Steud. Nom. ed. 2, pt. 1 (1840) 143; Dalz. & Gibs. Bomb. Fl. (1861) 292, Duthie Grasses N. W. Ind. (1883) 13, Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1891) 345, Hook. f. Fl. Brit. Ind. VII (1896) 71, Cooke Fl. Bomb. II (1908) 1001.

Anemagrostis tenella Wight ex Steud. Syn. Pl. Glum. I (1854) 115.

Arundinella pumila Steud. l c

Acratherum pumilum Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 414, t. 100.

Etymology : *Tenella* means tender, delicate.

Description : Annual, nearly glabrous, stems solitary or tufted, erect, glabrous or with a few scattered hairs. Leaves 2.5-7.5 cm. by 6-20 mm., ovate to linear-lanceolate, acuminate, membranous, many-nerved, sprinkled with a few slender soft hairs, base narrowed; sheaths usually glabrous with ciliate margins.

Panicle 5-25 cm. long, effuse, copiously branched; rhachis slender, strict, erect; branches alternate or the lower subverticillately fascicled, each with widely spreading capillary branches and branchlets. Spikelets the smallest of the genus, 1.6-2 mm. long; pedicels long, slender. Glumes 4; lower involucrel glume 1.2-1.6 mm. long, ovate-lanceolate, acute, thinly membranous, 3-nerved, upper involucrel glume longer, 1.6-2 mm. long, ovate-lanceolate, cuspidately acuminate, 5-nerved; lower floral glume 1.6 mm. long, ovate, obtuse, paleate; upper floral glume 1 mm. long, lanceolate, scabrid above, awn solitary, about 2.5 mm. long, the lower part brown, slightly twisted, the upper part pale.

Locality : *Khandesh* - Toranmal (McCann 9594 !).

Konkan - Pen (McCann 5502 !), Bombay (Lambert).

W. Ghats : Igatpurn (McCann 5354 !); Mahabaleshwar, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4522 !), common under the shade of trees (Dalzell, Cooke, Woodrow, Lisboa); Panchgani (Blatter 3798 !), Maratha Well (Blatter & Hallberg B1222 !); Karh and Khandala (Jacquemont 631); Khandala, very common (McCann 5354 !); Lonavla (Gammie !, Woodrow).

Deccan - Purandhar (McCann 5013 !).

N. Kanara : Yellapur, 2,000 ft., rainfall 100 in. (Sedgwick 3125 !); Halyal (Talbot 2553 !); Dandeh (Talbot 2268 !); Tmai (Talbot 2576 !).

Ecology : A very ornamental grass; found commonly throughout the hilly parts of the Presidency on rocks and walls in the open during the rains. Soon after the monsoon the plants die down.

Distribution : W. Himalaya, Khasia Hills, Bihar, Central India, W. Peninsula, Abyssinia.

Economic uses : Cattle do not care for the grass when dry.

Explanation of Plate 127 : *Arundinella tenella* Nees & Wight.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.

6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.
9. Ligule.

5. *ARUNDINELLA PYGMAEA* Hook. f.

Arundinella pygmaea Hook. f. Fl. Brit. Ind. VII (1896) 72; Cooke Fl. Bomb. II (1908) 1002; Janowski in Bot. Archiv I (1922) 25.

Etymology : *Pygmaea* means small like a pygmy.

Description : A small slender plant scarcely 15 cm. high; stem very slender. Leaves chiefly radical, 2.5-3.8 cm. by 2.5 mm., linear-lanceolate, nerveless except the strong midrib, with a few scattered long hairs and finely serrulate margins; sheaths glabrous.

Panicle erect, effuse; rhachis filiform; branches few, capillary. Spikelets 3 mm. long (including the cuspidation of the upper involucreal glume), ovoid-lanceolate, hispidly hairy; pedicels very long, capillary. Glumes 4; lower involucreal glume 2 mm. long, ovate, 3-nerved, hispid with long hairs; upper involucreal glume 3 mm. long, ovate-lanceolate, cuspidately acuminate, 5-nerved, hispid with long hairs; lower floral glume 2 mm. long, ovate, obtuse, coriaceous, with incurved margins, obscurely 5-nerved; upper floral glume about 1 mm. long, elliptic-oblong, awn solitary, 4-5 mm. long, the lower half brown, the upper half pale.

Locality : *W. Ghats* Crest of the W. Ghats (Woodrow); Mahabaleshwar, in public garden, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4619!), Khandala (McCann 5318!); Igatpuri, (Blatter & Hallberg 5143!).

N Kanara (Lisboa).

Distribution : Endemic.

6. *ARUNDINELLA CILIATA* Nees.

PLATE 128

Arundinella ciliata Nees ex Miq. in Verh. Nederl. Ind. III, IV (1851) 30; Janowski in Bot. Archiv I (1922) 25.

Holcus ciliatus Roxb. Fl. Ind. I (1832) 318.

Arundinella agrostoides Trin. Ic. XXIII (1828-36) t. 265, Cooke Fl. Bomb. II (1908) 1002.

A. agrostoides var. *ciliata* Hook. f. Fl. Brit. Ind. VII (1896) 71.

Branthia holcoides Kunth Rev. Gram. II (1835) 127, t. 170.

Perotis polystachya Heyne ex Hook. f. l. c. 71.

Description : Annual; stem 20-45 cm. long, stout or slender. Leaves 2.5-10 cm. by 6-13 mm., flat, narrowed to the base, clothed with long soft hairs; sheaths softly hairy; ligule a ridge of hairs.

Panicle 2.5-20 cm. long, contracted; branches fascicled, suberect. Spikelets 2.5-3.2 cm. long, ovoid-lanceolate, the lower half usually bristly; pedicels reaching 3 mm. long, slender, glabrous or nearly so. Glumes 4; lower involucreal glume ovate, acuminate, 3-nerved, usually with a few bristles on the lower half; upper involucreal glume 3-2 mm. long, ovate, cuspidately acuminate, 5-nerved; lower floral glume rather more than 2.5 mm. long, ovate-lanceolate, coriaceous, paleate, 3-nerved, the palea ovate-lanceolate, acuminate; upper floral glume about 1.2 mm. long, elliptic, obtuse, usually female, palea oblong, obtuse; median awn reaching 5 mm. long, the lower half twisted, brown, the upper half pale, gemculate above the twisted column; lateral awns 0.

Locality : *Konkan* (Wight). We have not seen any specimens.

Distribution : India, Philippines.

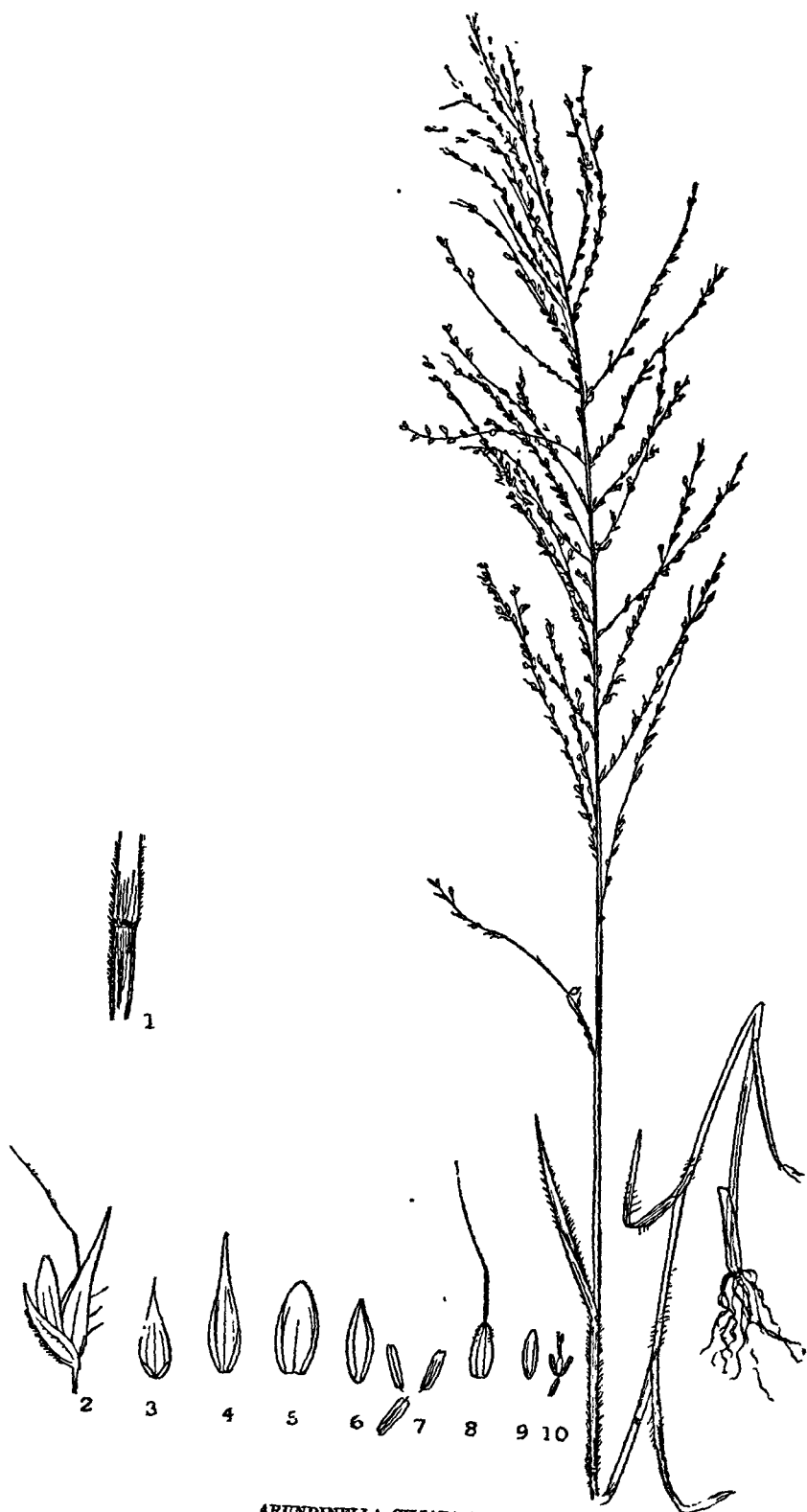
Explanation of Plate 128 : *Arundinella ciliata* Nees

1. Ligule.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Palea of lower floral glume.
7. Stamens.
8. Upper floral glume.
9. Palea of upper floral glume.
10. Stamens, ovary and styles.



ARUNDINELLA TENELLA NEES & WIGHT.

Desig. R. K. Baid.



ARUNDINELLA CILIATA NEES.

7. *ARUNDINELLA METZII* Hochst.

Arundinella Metzii Hochst. in Miq. Anal. Bot. Ind. pt. 2 (1851) 19; Steud. Syn. Pl. Glum. 116 (excl. syn. Roxb.); Cooke Fl. Bomb. II (1908) 1003.

Agrostis fusca Heyne ex Hook. f. Fl. Brit. Ind. VII (1896) 72.

Arundinella agrostoides Trin. var. *tenella* Herb. Ind. Or. Hook. f. & Th. ex Hook. f. l. c.

Description : Annual, 30-90 cm. high, stems slender erect. Leaves 10-15 cm. by 6-8 mm., linear, glabrous or sparsely hairy; sheaths glabrous or sparsely hairy.

Panicle 2.5-20 cm. long, effuse, rhachis slender, smooth or subscaberulous, branches elongate, alternate or fascicled, 2.5-10 cm. long. Spikelets 3 mm. long, ovoid-lanceolate. Glumes 4; lower involucre glume 2.5 mm. long, ovate-lanceolate, with a slender mucro about 0.8 mm. long, strongly 3-nerved, upper involucre glume 3.2 mm. long, similar, with a mucro about 1.2 mm. long, 5-nerved, lower floral glume elliptic, obtuse, 2.5 mm. long, 3-nerved, paleate, empty or male, the palea 1.6 mm. long, oblong-lanceolate, acute, hyaline, upper floral glume 1.2 mm. long, ovate, obtuse, palea as long as the glume, linear-lanceolate, subobtusate, awn solitary, 3-2 mm. long, the lower half brown, the upper pale.

Locality : W. Ghats Lonavla (Woodrow).

S. M. Country Devarayi, 1,800 ft., rainfall 90 in. (Sedgwick & Bell 4474 !).

N. Kanara Yellapur, 2,000 ft., rainfall 100 in. (Sedgwick 3469 !), Sunkal, rocky bank of a stream in evergreen forest, 500 ft., rainfall 150 in. (Sedgwick & Bell 5040 !); Birchay (Talbot 2105 ! 2116 ! 2488 !), Dandeli (Talbot 2268 !).

Distribution : W. Peninsula

8. *ARUNDINELLA LAWII* Hook. f.

Arundinella Lawii Hook. f. in Trim. Fl. Ceyl. V (1900) 180; Cooke Fl. Bomb. II (1908) 1003.

A. agrostoides Hook. f. Fl. Brit. Ind. VII (1896) 71 (*partim*).

Vernacular names : Kotir, Dundu

Description : Perennial, stems tufted, erect, 60-120 cm. high, leafy, smooth; nodes hairy. Leaves 20-30 cm. by 6 mm., linear, finely acuminate, flat, sparsely hairy, with nearly smooth margins, sheaths elongate, glabrous or nearly so, auricled and ciliate at the mouth, ligule a tomentose lunate ridge

Panicle 30-50 cm. long, pyramidal, decompound, effuse, drooping, rhachis slender, smooth; lower branches reaching 15 cm. long, in distant fascicles, filiform, spreading, flexuous, branchlets capillary. Spikelets numerous, usually hairy, rather more than 2.5 mm. long (excluding the awns), pedicels very long. Glumes 4, lower involucre glume about 2 mm. long (including a short slender awn about 0.6 mm. long), lanceolate, acute, 3-nerved, hairy on the nerves, thinly membranous, upper involucre glume similar to the lower but longer (nearly 5 mm. long, including an awn of nearly 2.5 mm. long), 5-nerved, hairy on the nerves, thinly membranous; lower floral glume rather less than 2.5 mm. long, shorter than the upper involucre glume, oblong, subobtusate, faintly 5-nerved, not awned, hyaline, paleate, the palea narrowly oblong, subobtusate with a faint median nerve, upper floral glume 1.2-1.6 mm. long, elliptic-lanceolate, acute, hyaline, usually 3-nerved, with incurved margins and a long filiform awn reaching 13 mm. long, 2-sexual.

A most variable plant.

Locality : Konkan (Woodrow 35 !); N. and S. Konkan (Law.).

Ecology : Grows mostly in streams and river-beds.

Distribution : W. Peninsula, Ceylon.

9. *ARUNDINELLA HISPIDA* O. Ktze.

Arundinella hispida O. Ktze Rev. Gen. (1891) 761, Janowski in Bot. Archiv I (1922) 26.

Andropogon hispidus Willd. Sp. Pl. IV (1805) 908.

Ischaemum hispidum H. B. & K. Nov. Gen. & Sp. I (1815) 194.

Arundinella brasiliensis Raddi Agrost. Brasil. (1823) 37, t. 1, fig. 3, Trin. Diss. II, 62, Sp. Gram. Ic. t. 266, Hook. f. Fl. Brit. Ind. VII (1896) 73, Cooke Fl. Bomb. II (1908) 1003.

A. pallida Nees Agrost. Brasil. (1829) 465.

Acratherium miliaceum Link Hort. Berol. II (1841) 234.

Orthopogon agrostoides Trev. ex Steud. Nom. ed. 2, II (1841) 234.

Andropogon virens Spreng Syst. I (1825) 287.

Arundinella Mikani Nees l. c. 465.

Goldbachia Mikani Trin. in Spreng. Neue Entdeck. II (1821) 81.

Prideles Mikani Trin. ex Kunth Enum. Pl. I (1833) 515.

Ara brasiliensis Spreng. Syst. I (1825) 278.

Ischaemum pallidum Kunth Enum. Pl. I (1833) 515.

Arundinella Rutchiei Munro ex Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1891) 343.

Holcus nervosus Roxb. Fl. Ind. I (1832) 318.

Arundinella nepalensis Trin. Sp. Gram. (1828) t. 268, Duthie Grasses N. W. Ind. (1883) 13; Lisboa l. c. 343.

Description : Perennial, rootstock stout, hard, creeping and sending out stout sheathed branches sometimes as thick as a goosequill, or tufted and intricately branched; stems 30-150 cm. long, stout or slender, simple or branched, hairy or almost glabrous; nodes glabrous or pubescent. Leaves 15-30 cm. by 4-17 mm., usually ciliate at the narrow base, glabrous or hairy; sheaths usually glabrous; ligule a minute ridge fringed with long hairs.

Panicle pyramidal, thyrsiform or subcorymbose, 10-45 cm. long; rhachis angular, usually glabrous, branches 2.5-25 cm. long, few or many, fasciculate or subverticillate. Spikelets 4-5 mm. long, subsecund, pedicellate, ovoid-lanceolate, usually glabrous. Glumes 4; lower involucre glume 3-2 mm. long, ovate-lanceolate, acuminate, subacute, 3-nerved, glabrous or (rarely) sparingly setose; upper involucre glume 5 mm. long, ovate-lanceolate, acuminate, 5-nerved, lower floral glume 4 mm. long, elliptic-oblong, obtuse or shortly 2-fid, 3-5-nerved, paleate, empty or male, the palea 3-2 mm. long, lanceolate, hyaline; upper floral glume less than 3-2 mm. long, bearded at the base, narrowly ovate-lanceolate, scaberulous, 2-sexual; awn 4 mm. long, straight or slightly twisted, brown below, pale above; palea narrowly lanceolate, acute, as long as the glume.

A most variable plant. See Hook. f. Fl. Brit. Ind. VII, 74.

Locality : W. Ghats. Khandala (Saxton 1205 l, Lisboa); Lonavla (Hallberg 9660 l, Garade l, Lisboa), Mahabaleshwar, 4,500 ft., rainfall 270 in. (Dalzell & Gibson, Lisboa), in a stream (Sedgwick & Bell 4543 l), Panchgam (Woodrow); Castle Rock, on banks of Duoki River, 1,900 ft. (McCann 9855 l).

N. Kanara. Kala Nuddi to Supa, 1,800 ft., rainfall 100 in. (Sedgwick & Bell 4872 l); Yellapur, in a gravelly stream-bed, 2,000 ft., rainfall 100 in. (Sedgwick 3126 l); Sampkhand, in river-bed (Hallberg & McCann A159 l); Dandeh (Talbot 2241 l).

Distribution : Throughout the hilly parts of India, China, Malaya, Australia, tropical America

10. ARUNDINELLA MUTICA Nees.

Arundinella mutica Nees ex Steud. Syn. Pl. Glum. (1855) 116.

A. capillaris Hook. f. Fl. Brit. Ind. VII (1896) 74; Cooke Fl. Bomb. II (1908) 1004.

Andropogon capillaris Herb. Heyne ex Hook. f. Fl. Brit. Ind. l. c. 75.

Hook. f. had called this plant *A. capillaris* though Nees had given it the name *mutica* in 1855. As an explanation he gave the following: "Nees describes the leaves as with sparsely setulose margins and gl. IV as mucronate, from which it is evident that the awn has fallen away in his specimen. This latter suggested the name *mutica*, which being misleading I have replaced by Heyne's of *capillaris*." This cannot be considered a sufficient reason to change a name.

Description : Perennial, very slender, stem erect from a tuberous rhizome which is clothed with the woolly bases of leaf-sheaths; nodes glabrous. Leaves 15-30 cm. by 4-8 mm., linear, acuminate, glabrous or hairy; sheaths glabrous, striate; ligule a ridge of hairs.

Panicle oblong, 12.5-18 cm. long; rhachis filiform, scaberulous; branches alternate, slender, 10-15 cm. long. Spikelets 4-5 mm. long, glabrous, solitary or geminate; pedicels long, capillary, angular. Glumes 4; lower involucre 3-2 mm. long, ovate, acute, with a long slender mucro, 3-nerved, with a scaberulous keel; upper involucre glume reaching 5 mm. long, ovate-lanceolate, narrowed into a subcuspidate acuminate tip, 5-nerved; lower floral glume rather more than 3.2 mm. long, ovate-oblong, subacute, 3-nerved, paleate, the palea 3-2 mm. long, oblong-lanceolate, acute, hyaline; upper floral glume 3-2 mm. long, lanceolate, acute, slightly scabrid; palea oblong-lanceolate, acute; awn nearly 6 mm. long, geniculate about the middle, easily breaking off.

Locality : Konkan. Parel, Bombay Island (Woodrow).

N. Kanara. Kala Nuddi (Woodrow)

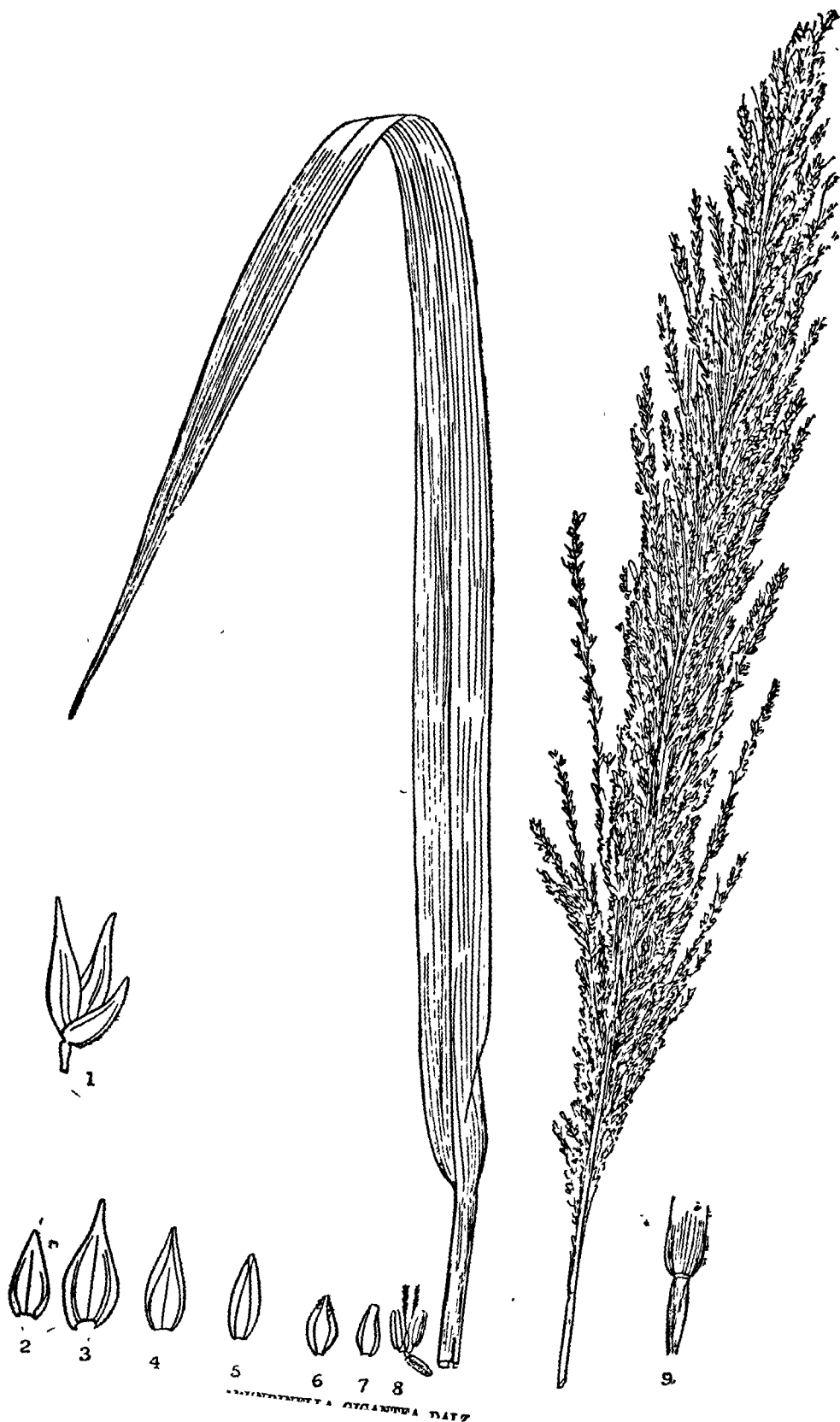
We doubt the occurrence of this species in the Bombay Presidency. Woodrow gives two localities, but neither Cooke nor we have seen his specimens. Lisboa (Journ. Bomb. Nat. Hist. Soc. V (1891) 8) calls this plant common all over Bombay. If it is really common it is strange that we should never have met it.

Distribution : W. Peninsula.



ARUNDINELLA SPICATA DALZ.

Delin: R. K. Bhide



11. *ARUNDINELLA SPICATA* Dalz.

PLATE 129.

Arundinella spicata Dalz. in Dalz. & Gibs. Bomb. FL (1861) 293; Hook. f. FL Brit. Ind. VII (1896) 77, *sub specieb. indeterminab.*; Cooke FL Bomb. II (1908) 1004.

Description : A small grass in appearance resembling a *Setaria*; stem 15-30 cm. high, erect, simple. Leaves 2.5-3.8 cm. by 6 mm., linear-lanceolate, acute, densely hispid with long hairs; sheaths densely hispid, ligule a minute hairy ring.

Inflorescence of cylindric racemes 2-5 cm. long. Spikelets 6 mm. long to top of upper involucre glume, pedicels very short. Glumes 4, lower involucre glume 1.6-2 mm. long, lanceolate, acuminate, with a few long bulbous-based hairs, 3-nerved; upper involucre glume reaching 6 mm. long, narrowly lanceolate, attenuated into a long acuminate point, folded round and completely concealing the upper floral glume and its awn, 3-nerved and with a few scattered long hairs, lower floral glume 2-5 mm. long, lanceolate, acute, thinly membranous, glabrous, paleate, empty or male, the palea 1.6 mm. long, lanceolate, acute; upper floral glume 1.2 mm. long, oblong, obtuse, female or 2-sexual; palea lanceolate, acute, hyaline, awn 4 mm. long, the lower half brown, the upper pale geniculate about the middle.

Locality : *W. Ghats* : Mahabaleshwar, common in open localities, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4508'), common on the Mahabaleshwar Hills (Dalzell & Gibson, Woodrow, Cooke); Panchgani, very common on the Tablelands (Blatter 3797', McCann').

Ecology : A monsoon species, appearing in flower by the end of September.

Distribution : W. Peninsula; so far endemic.

Explanation of Plate 129 : *Arundinella spicata* Dalz.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Grain.

12. *ARUNDINELLA VILLOSA* Wight & Arn.

Arundinella villosa Wight & Arn. ex Steud. Syn. Pl. Glum. I (1854) 115; Hook. f. FL Brit. Ind. VII (1896) 72 *cum omnibus varietatibus*.

A. Hookeri Munro ex Hook. f. l. c. 73.

Description : Stem 30-40 cm. high, tufted, slender, stiff, leafy at the villous base, villous below the panicles. Leaves 10-20 cm. by 2-2.5 mm., strict, rather rigid; glabrous, tomentose or villous. Ligules of long hairs. Panicle very narrow, 5-10 cm. long, spiciform, rhachis villous; branches 12-18 mm. long, brown.

Spikelets subdistichously crowded, spreading or erect, 5-6 mm. long, setosely hirsute. Lower involucre glume $\frac{2}{3}$ of upper, long-pointed, 3-5-nerved, upper involucre glume subaristately long-pointed, 5-nerved. Lower floral glume sharp-pointed, 5-nerved, neuter or male; upper oblong-lanceolate very minutely scaberulous, rounded at the tip, sometimes 2-dentate, awn not twice as long as the spikelet, column of awn included, twisted.

The leaves vary a good deal as to their size. In addition to the measurements given above, the following have been observed: 30 cm. by 8 mm. and 5-15 cm. by 6-8 mm.

Locality : *W. Ghats* : Khandala (McCann 9602A ' 9602B').

Distribution : E. Himalaya, Khasia Hills, Central India, Deccan Peninsula, Ceylon.

13. *ARUNDINELLA GIGANTEA* Dalz.

PLATE 130.

Arundinella gigantea Dalz. in Dalz. & Gibs. Bomb. FL (1861) 293; Hook. f. FL Brit. Ind. VII (1896) 76; Cooke FL Bomb. II (1908) 1005.

Description : A tall grass, stems erect, smooth, terete, 1-8 m. high, as thick as a goose-quill at 45 cm. below the panicle, nodes glabrous. Leaves 30-60 by 2.2-3.2 cm., linear-lanceolate, finely acuminate, glabrous or sparsely hairy, many-nerved, base rounded or cordate, sheaths striate, sparsely hairy or almost glabrous; ligule a narrow glabrous membrane.

Panicle subcorymbosely thyrsiform, 12-5-18 by 5-7.5 cm.; rhachis stout, scabrid, angular, concealed by the numerous erect angular branches which are 5-10 cm. long. Spikelets 2-5-3 mm. long. Glumes 4; lower involucre glume 2 mm. long, broadly ovate, acute, strongly, 3-nerved, with a scaberulous keel; upper involucre glume 2.5-3-2 mm. long, ovate, narrowed

into an acuminate point, 5-nerved; lower floral glume 2-2.5 mm. long, ovate, subobtusate, 3-5-nerved, paleate, the palea 1-6 mm. long, elliptic, hyaline, upper floral glume 1-6 mm. long, elliptic, thickly coriaceous, white, without an awn.

Locality: *Konkan* (Stocks), Kineashvar, below the Ghats (Dalzell & Gibson).

W. Ghats Londa (Bhide!), Castle Rock, in shade (McCann 9853 l, Gammie 15668 l)

S. M. Country. Devarayi (Sedgwick 4474 l)

N. Kanara. Dudsagar Falls (McCann A174 l), Nagerali, forests, 1,800 ft., rainfall 80 in. (Sedgwick 2921 l), Birchy (Talbot 2250 l), Dandeh (Talbot 2493 l), Tinai Ghat (Talbot 2627 l), Jugglepet (Talbot 1387 l), Supa (Talbot 2493 l); Karwar (Hallberg & McCann A161 l), Gersoppa Falls, on rocks, in river-bed (Hallberg & McCann A160 l), Yellapur (Sedgwick 3469 l, Talbot l)

Distribution: W Peninsula, so far endemic.

Explanation of Plate 130: *Arundinella granatea* Dalz.

1. Spikelet
2. Lower invol glume
3. Upper invol glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.
9. Ligule.

64 TRISTACHYA Nees.

Perennial, usually coarse grasses. Leaves various.

Spikelets 2-flowered (lower flower male, the upper 2-sexual), large, lanceolate to linear, sessile or shortly pedicellate, in clusters of 3 at the tips of the branchlets of a raceme or panicle; rachilla not produced beyond the upper floret. Glumes 4; involucrel glumes more or less unequal, not awned, persistent 3-nerved, membranous or subcoriaceous; lower floral glume membranous, 3-7-nerved, not awned, upper floral glume membranous or ultimately cartilaginous, 2-lobed, with a long twisted awn in the sinus (copiously bearded above the middle, in the Indian species), palea hyaline, 2-keeled. Lodicules 2, cuneate, fleshy. Stamens 3. Styles slender, stigmas plumose, laterally exserted. Grain narrow, free.

Species 10. Tropics except Australia.

1. TRISTACHYA BARBATA Nees.

Tristachya barbata Nees ex Steud. Syn. Pl. Gram. (1855) 238; Boiss. Fl. Or. V (1884) 552; Duthie Grasses N. W. Ind (1883) 32; Hook. f. Fl. Brit. Ind. VII (1896) 272; Cooke. Fl. Bomb. II (1908) 1005.

T. Stocksii Boiss l c, Munro in Aitchis Cat. Panjab Pl (1869) 168, Duthie Fodder Grasses N. Ind (1888) 51.

Loudetia barbata A. Braun in Flora XXIV (1841) II, 714.

Sorghum barbatum Hochst. & Steud. Pl. Arab. Exsicc. no. 788 ex Hook. f. l. c.

Etymology: *Tristachya* means 3-spiked, alluding to the spikelets which are congested in threes at the ends of the panicle branchlets.

Description: Stem 15-45 cm., branched and woody at the base, geniculately ascending, the base clothed with tomentose leaf-sheaths, nodes woolly. Leaves 2.5-7.5 cm. by 2-5-4 mm., linear-lanceolate from a rounded base, finely acuminate, pungent, rigid, glaucous, many-nerved, with a subserrulate thickened margin.

Panicle 2.5-5 cm. long and nearly as broad, sparingly branched; branches solitary and 2-nate, capillary. Spikelets nearly 13 mm. long (excluding the awn); callus glabrous. Glumes 4; lower involucrel glume 6 mm. long, ovate-lanceolate, subacute, 3-nerved; upper involucrel glume 8 mm. long, oblong-lanceolate, 3-nerved; lower floral glume nearly 13 mm. long, male, lanceolate, acuminate, interruptedly 7-nerved, with a linear-lanceolate palea 6 mm. long; upper floral glume 8 mm. long, 2-sexual, densely hairy on the back above the middle with very slender hairs nearly 4 mm. long, 2-lobed, the lobes lanceolate, acute, aristate, each lobe 3-nerved, 4 mm. long with an awn 16 mm. long from the sinus; palea lanceolate, acute, 6 mm. long.

Locality: *Sind* (Stocks 1217, 648 ex Cooke).

Distribution: Sind, Baluchistan, Arabia, Nubia.

TRIBE V : *Aveneae*.

Florets 2 to many, all alike (except the uppermost which often are reduced) Involucral glumes generally hyaline or scarious and shining Floral glumes membranous or subherbaceous with hyaline shining margins or firmer, 5- or more-nerved, rarely 3-nerved (with the side-nerves delicate and not submarginal), awn, if present, from the back or from the sinus, or from between bristles, kneed and usually twisted below the knee.

See key page xviii.

65. *AVENA* LINN.

Annual or perennial herbs, low or moderately tall. Panicles narrow or open, usually rather few-flowered of usually large spikelets. Spikelets 2-several-flowered, rachilla bearded, disarticulating above the involucral glumes and between the flowering glumes. Involucral glumes about equal, membranous or papery, several-nerved, longer than the lower floret, usually exceeding the upper floret Floral glumes indurate, except toward the summit, 5-9-nerved, bidentate at the apex, bearing a dorsal bent and twisted awn, which is straight and reduced in *Avena sativa*.

The genus as just described does not include *Trisetum* Pers as is the case in Hook. f.'s *Avena* in Fl Brit Ind. VII, 274.

Species about 55—Chiefly temperate regions One species cultivated in the Presidency.

*1 *AVENA SATIVA* LINN

Avena sativa Linn. Sp Pl. (1753) 79; Hook. f. Fl Brit Ind. VII (1896) 275, Duthie Field and Gard. Crops pt. I, 13, pl III, Grasses N. W. Ind. (1883) 31, Fodder Grasses N. Ind (1888) 51, Mukerji Handb Ind Agric 247-8; Molles Textb Agr. III, 49-51.

Vernacular names : Oats, Jai.

Etymology : *Avena* was the name of some wild oats of the ancient Romans

Description : An annual grass Stems erect, tufted, smooth, 1-2 m high Blades flat, up to 30 cm high and 12 mm wide, scabrous, especially on the margins, ligule membranaceous, truncate, 1-3 mm long, toothed or serrate, decurrent along the margin of the sheath, sheaths smooth, striate, the lower rather papery.

Panicle open or more or less contracted, erect or nodding, sometimes 1-sided, the pedicels thickened at the apex. Spikelets large, drooping, variable in size, but usually about 20-25 mm. long, involucral glumes strongly several-nerved, membranaceous, acuminate, scabrous, containing usually 2 florets, floral glumes smooth or slightly hairy at the base, teeth acute but not awned, the dorsal awn absent or, if present, usually straight and not much longer than the involucral glumes, often present only on the lower floret, palea enclosed by the involution margin of the glume, densely short-ciliate on the 2 keels The florets do not easily disarticulate, which condition is probably due to cultivation

Locality : Very little cultivated in the Presidency. Has been grown at Hyderabad (Sind), also at military grass farms for military horses at Ahmednagar and elsewhere.

Ecology : This crop is only grown in the rabi season and in this Presidency always under irrigation. It does best on well-drained, friable soils of fair depth.

Distribution : See De Candolle, Origin of Cult. Pl. 373-6 and Hehn, Kulturpfl. and Haust. (1894) 539.

Economic uses : The crop is grown at remount and horse-rearing depots not so much for the grain as the fodder. The crop has a special position as an excellent fodder crop (Mann.).

For a useful introduction to the study of oats-see: Herbert Hunter: Oats, their varieties and characteristics. London, 1924.

66. *COELACHNE* R. Br.

A small, leafy, variable marsh grass. Leaves short, flat or convolute.

Spikelets 2-flowered (both flowers perfect or upper imperfect) in open or contracted or spikeform panicles, not articulate on the pedicels, not awned. Rachilla jointed at the base, produced between the lower and upper floral glume but not beyond the upper. Lower involucral glume suborbicular, concave, obtuse and delicately nerved; upper smaller, more oblong, both persistent. Lower floral glume much longer, subsessile, coriaceous, glabrous, except the shortly bearded callus, palea as long, coriaceous; upper much smaller and palea more or less hairy. Stamens 3; anthers long, narrow. Ovary ovoid; stigmas free. Grain free within the glume and palea.

Species 3 or 4.—East Indies, S. China, tropical Australia, E. Africa, Madagascar.

1. COELACHNE PULCHELLA R. Br.

PLATE 131.

Coelachne pulchella R. Br. Prodr. (1810) 187; Lisboa Bomb. Grasses (1896) 96; Hook. f. Fl.

Brit. Ind. VII (1896) 270 *cum omnibus varietat.*

C. brachyata Munro ex Benth. Fl. Austr. VII (1878) 626 (*partim*).

C. infirma Buees Pl. Jungh. I, 350; Miq. Fl. Ind. Bat. III, 399.

C. madagascariensis Bak. in Journ. Linn. Soc. XXV (1890) 348.

C. perpusilla Thw. Enum. Pl. Zeyl. (1864) 373 (*partim*).

Isachne brachyglumis Hochst. in Hohen. Pl. Nilgh. no 1283 (*nomen tantum*).

I. perpusilla Wight & Arn. ex Wight Cat. no. 2043.

Panicum simpliciusculum Wight & Arn. ex Steud. Syn. Pl. Glum. 96.

Etymology : *Coelachne* is derived from *koilos*, a hollow, and *achna*, a glume, perhaps alluding to the two concave lower glumes.—*Pulchella* means beautiful.

Description : Stems 15-45 cm. high, flaccid, decumbent or ascending, slender or rather stout, leafy up to the panicle. Leaves uniform throughout the stem, 1-2.5 cm. long, lanceolate, subulate, acuminate, distant or subequitantly sheathing, ecostate, minutely scaberulous above, nerves striate; ligule a few hairs.

Panicle very various. Spikelets 1-2.5 mm. long, sessile or pedicelled, globose or ovoid. Lower involucrel glumes suborbicular or hemispheric, many-nerved, membranous or herbaceous. Lower floral glume hermaphrodite, coriaceous, dorsally rounded, nerves 0 or very obscure, palea coriaceous, margins incurved; upper much the smallest, often imperfect, neuter or female.

Locality : *W. Ghats*. Mahabaleshwar, by the lake, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4851 !), Castle Rock, in a marsh (Bhide !, McCann !)

S. M. Country : Roadside near Khanapur, 2,500 ft., rainfall 60 in. (Sedgwick 2960 !).

N. Kanara : Kumbmoada (Talbot 2273 !); Karwar, in wet fields (McCann !);

Sirsi to Siddhapur, in fields (Hallberg & McCann A47 !).

Ecology : A subgregarious species, growing in marshes.

Distribution : Of the genus.

Explanation of Plate 131 : *Coelachne pulchella* R. Br.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Stamens, ovary and styles
6. Upper floral glume.
7. Palea of upper floral glume.
8. Ovary and styles.
9. Spikelets.

67. DANTHONIA Lam.

Annual or perennial grasses, tufted, low or moderately tall.

Panicle few-flowered, open or spike-like of rather large spikelets. Spikelets 3-many-flowered, with the uppermost florets reduced, erect, not jointed on their pedicels. Rhachilla hairy, readily disarticulating above the involucrel glumes and between the flowering glumes, produced beyond the uppermost glume. Lower involucrel glumes empty, subequal, as long as the whole spikelet, persistent, keeled, acute or acuminate, 3-9- (rarely 1-) nerved. Flowering glumes dorsally rounded, ciliate, 7-9-nerved, 2-fid, lobes acute, usually extending into slender awns, a stout awn arising in the sinus; awn flat, tightly twisted below, geniculate, exserted, including 3 nerves of the glume; palea broad. Lodicules 2, fleshy. Stamens 3. Styles free. Grain free within the membranous or hardened glume and palea.

Species about 100. In the temperate regions of both hemispheres, especially abundant in S. Africa.

1. DANTHONIA GAMMIEI Bhide.

Danthonia Gammiei Bhide in Journ. & Proc. As. Soc. Beng. new series, VII (1911) 513; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 236.

Etymology : The specific name was given in honour of George Gammie, Director of the Botanical Survey of Western India.

Description : Stem 10-60 cm. high, nodes glabrous. Leaves linear, glabrous below, sparsely long-ciliate above, 2.5-7.5 cm by 2.5-3 mm., base rounded; ligule a very narrow, truncate, fimbriate membrane; sheaths glabrous; upper leaves very much reduced in size.



COELACHNE PULCHELLA R. BR.

Drawn: B. K. Bhude.



THYSANOLAENA PROCERA MEZ.

Deten: B. K.

Peduncle and rachis hairy, panicle lax, racemose, 2.5-5 cm. by 12-16 mm. Spikelets few, short-pedicelled, about 18 mm. long excluding the awns. Involucral glumes empty, lanceolate, acuminate, lower one strongly 5-nerved dorsally, rounded, glabrous, subcoriaceous, margins membranous; upper one by $\frac{1}{2}$ shorter than the lower, membranous, 3-nerved. Lower floral glume without the awns much smaller than the involucral glumes, terete, convolute, 7-9-nerved, dorsally villous all over, 2-dentate with a stout broad median awn; column of awn golden yellow, twisted and shining, tail minutely scabrid, dorsally narrowly 2-channelled; teeth produced into small slender awns reaching as far as the column of the median awn, with a fringe of long white hairs at the junction of the lateral awns with the glume; rachilla produced and terminating in a minute, ciliate, awned or awnless barren glume (upper floral glume); lodicules membranous, half as long as the anthers, oblong, emarginate. Stamens 3 Styles 2, distinct. Anthers and plumose stigmas protruding from the top of flowering glume.

Locality: *W Ghats* · Castle Rock (Gammie !),

N Kanara · Jog to Siddhapur, open grass-land on rocky soil (McCann A50 + A51 !); Mirjan, laterite flats (Hallberg A49 !).

Ecology: Grows in open grass-land on rocky soil.

Distribution: So far endemic.

TRIBE VI: Arundineae.

Florets 2 to many, enveloped by very long hairs, springing either from a long and slender callus or from the back of the floral glumes. Involucral and floral glumes membranous, often hyaline, awnless or minutely awned from the tips

See key page xviii

68. THYSANOLAENA Nees.

A large glabrous reed-like grass; stems solid. Leaves broad, flat. Spikelets innumerable, very minute, 1-flowered, jointed on very short pedicels and subsecund on the very numerous crowded, long, filiform, compound, suberect branches and branchlets which form a very large effuse pyramidal panicle; rachilla produced but not beyond the floret. Glumes 4; involucral glumes small, concave, awnless, faintly nerved or nerveless, lower floral glume rather longer than the upper, empty, acuminate, epaleate, upper floral glume ovate, acute, ciliate, with long erect white hairs, palea short, truncate. Stamens 2-3; anthers short. Styles free. Grain very minute, free within the hardened glumes.

Species 1.—Tropical Asia

Cooke has one species: *Thysanolaena Agrostis* Nees. We change it into *T. procera* Mez

1. THYSANOLAENA PROCERA Mez.

PLATE 132.

Thysanolaena procera Mez. in Janowski Bot Archiv I (1922) 27.

Agrostis procera Retz. Obs IV (1786) 19.

Melica latifolia Roxb Hort. Beng (1814) 8

Agrostis latifolia Heyne ex Hook f. Fl. Bnt. Ind. VII (1896) 61.

A. maxima Roxb. Fl. Ind I (1832) 317

Thysanolaena maxima O Ktze. Rev. Gen. II (1891) 794.

Panicum acarifolium Trin Sp. Gram Ic I (1828) 87

Thysanolaena acarifera Nees & Arn. in Nov. Act. Leopold. XIX, Suppl. I (1843) 181; Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1890) 347, Duthie Grasses N. W. Ind. (1883) 13, Fodder Grasses N. Ind. (1888) 21.

T. Agrostis Nees in Edinb. N. Phil. Journ. XVIII (1835) 180, Hook f. Fl. Bnt. Ind. VII (1896) 61, Cooke Fl. Bomb II (1908) 1006.

Myriachaeta arundinacea Zoll. & Mor Syst. Verz. Zoll. (1845-46) 101.

M. glauca Mor. ex Steud. Syn. Pl. Glum. I (1855) 404.

Vernacular name: Barucha.

Etymology: *Thysanolaena* is derived from *thysanos*, fringe, tassels, and *laena*, a garment or cloak, alluding to the very compound panicle.

Description: A large handsome grass, stem 1.2-3.6 m. high, reaching sometimes 10 mm. diam., glabrous, polished. Leaves very large, 30-60 by 5-10 cm., coriaceous, linear-lanceolate, tapering to a fine point, many-veined, base cordate; sheaths glabrous, striate, hairy at the mouth; ligule small, ciliate.

Panicle large, 30-60 cm. long, soft, glabrous, branches very numerous, suberect, filiform, with many short branchlets carrying small spikelets. Spikelets 1.2-1.6 mm. long, ovoid-lanceolate, acuminate, pedicellate; rachilla produced into a linear-lanceolate point about 0.5 mm. long. Glumes 4, involucrel glumes less than 0.8 mm. long, subequal, about half as long as the floral glumes, ovate, subacute, hyaline, obscurely 1-nerved; lower floral glume longer than the upper, lanceolate, acuminate, membranous, glabrous, epaleate, empty, 1-nerved; upper floral glume ovate-lanceolate, acuminate, ciliate with long white erect hairs.

Locality: *Gujarat:* In bed of nala (Sedgwick & Bell 5393 !); *Bansda*, Surat Dist. (Woodrow).

Khandesh: (Lisboa), Chanseli to Dadgaum, in a dry nala (McCann 9589 !); *Dangs* (Woodrow).

Konkan: Victoria Gardens, Bombay (McCann 9846 !); *Thana* (Lisboa).

Deccan: Ganeshkhind Botanic Gardens (McCann 9847 !); *Nasik* (Lisboa).

Ecology: Grows on banks of nalas in the drier parts of the Presidency. "Not uncommon on the plains and on low elevation on the hills, usually in the vicinity of water." (Duthie).

Distribution: Throughout India, Penang, eastwards to New Guinea.

Medicinal uses: A decoction of the root is used as a rinse for the mouth in cases of fever (Cambell).

Explanation of Plate 132: *Thysanolaena procera* Mez.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.

69. PHRAGMITES Adans.

Tall perennials with a creeping rhizome; stem stout, hollow, leafy upwards. Leaves long, flat.

Panicle lax, usually very large and decompound. Spikelets conspicuously silky from the long hairs on the callus, loosely 3-10-flowered, awnless; rachilla disarticulating above the lower and between the following floral glumes, slender, penicillate with long hairs, not produced beyond the flowering glumes. Glumes glabrous; involucrel glumes unequal, oblong-lanceolate, acute, 3-nerved, membranous, persistent; floral glumes heteromorphous, the lowest linear-lanceolate, much exceeding the involucrel glumes, the following very thin, more or less caudate-acuminate, hyaline, 3-nerved, callus long, slender, densely clothed with very long silky hairs. Paleae linear-oblong, about half as long as their glumes, 2-keeled. Lodicules 2 (sometimes 3 in the lower floret). Stamens 3 (sometimes 2 in the lower floret). Styles 2, distinct, rather short; stigmas laterally exserted, densely plumose. Grain oblong, semiterete.

Some European authors have taken up *Trichoon* Roth, Archiv. Bot. Roemer I, pt. 3 (1798) 37 as antedating *Phragmites* Trin. Fund. Agrost. (1820) 134. The latter name, however, dates from Adanson (1763) and should be retained. Cf. M. L. Fernald, the Generic name *Phragmites* in *Rhodora* 24 (1922) 55-56. Also. Hitchcock, *Genera of Grass*. Unit. Stat. in Bull. 772 Unit. St. Dept. Agric (1920) 64.

Species 2.—One cosmopolitan and one in the Argentine.

1. PHRAGMITES MAXIMA Blatter & McCann, nov. comb.

Arundo maxima Forsk. Fl. Aegypt-Arab. (1775) 24.

Phragmites communis Trin. Fund. Agrost. (1820) 134; Boiss. Fl. Or. V (1884) 563. Duthie Grasses N. W. Ind. (1883) 35, Fodder Grasses N. Ind. (1888) 601; Lisboa Bomb. Grasses (1896) 116, Hook. f. Fl. Brit. Ind. VII (1896) 303; Muschler Man. Fl. Egypt I (1912) 115.

Ph. bifaria Wight Herb. no. 3310 ex Hook. f. l. c. 304.

Ph. chilensis Steud. Nom. ed. 2, II (1841) 234.

Ph. hispanica Nees in Nov. Act. Nat. Cur. XIX, Suppl. I (1843) 174.

Ph. humilis Not. in Cat. Hort. Genuen (1846) 27.

Ph. Karika Trin. ex Steud. Nom. ed. 2, II (1841) 324; Lisboa Bomb. Grasses (1896) 116; Croke Fl. Bomb. II (1908) 1007.

Ph. longivalvis Steud. l. c. 196.

Ph. maur. anica Kunth Rev. Gram. I (1829) 80, 277, t. 50; Enum. Pl. I (1838) 251.

Ph. n. palensis Nees ex Steud. Syn. Pl. Glum. 196.

Ph. pumila Griseb. in Goett. Nachr. (1868) 76 (an Willk.?).

- Ph. Roxburghii* Steud. l. c., Duthie Grasses N W Ind (1883) 35, Fodder Grasses N Ind. (1888) 60; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 378.
Ph. vulgaris Trin. Fund. Agrost. (1820) 134; Merrill Interpr. Rumph. Herb. Amb. (1917) 95.
Arundo Coreia Herb. Rottl. ex Hook. f. Fl. Brit. Ind. VII (1896) 304.
A. Donax Herb. Ham. ex Wall. Cat. no. 5017-B. A.
A. graeca Link. in Linnaea IX (1834) 136.
A. Karka Retz. Obs. IV (1786) 21, Roxb. Fl. Ind. I (1832) 347.
A. Phragmites Linn. Sp. Pl. (1753) 81; Ledeb. Fl. Ross. IV, 393.
A. Roxburghii Kunth Rev. Gram. I (1829) 79; Griff. Not. III, 47, Ic. Pl. Asiat. t. 139, fig. 243.
A. Roxburghiana Kunth ex Steud. Nom. l. c.
A. tibialis Roxb. Ic. Pict. (ined.) t. 854 et in Wall. Cat. no. 5017 G.
A. vulgaris Lam. Fl. Franc. 3 (1778) 81.
Canna palustris Rumph. Herb. Amb. 4, 20, t. 5.
Czernya arundinacea Presl Cyp. & Gram. Sicil. 22.
Oxyanthus japonica Steud. l. c. 197.
Servourea japonica Steud. in Flora XXIX (1846) 20.
Trichoon Karka Roth. Catal. II, 2.

As can be seen from the above synonymy we have united *Ph. communis* Trin. and *Ph. Karka* Trin. under the name of *Ph. maxima* Forskal's name *Arundo maxima* is the oldest (1775), 3 years older than Lamarck's *Arundo vulgaris* (1778).

Hook. f. kept the two species separate, but he gives sufficient reasons for uniting them in a note under *Ph. Karka*.

"Except by its greater size, larger more spreading panicle with rather smaller spikelets, more spreading glumes, and shorter gl. III, I can point out no character whereby herbarium specimens of *P. Karka* can be distinguished from *P. communis*, and none of those are constant. In both dwarf or very slender states occur with almost filiform leaves and greatly reduced panicles. Dr. Stapf, who has carefully revised my separation of the great pile of Indian specimens into the two species, is equally at a loss to point out any other characters than those given above whereby to distinguish them, except that the rachilla appears to him to be rather longer and more slender in *P. Karka* and the glumes hence more widely apart, and the glumes also are rather narrower. The perennial duration of the stems and leaves of *P. Karka* requires verification. These organs are undoubtedly annual in the northern form of *P. communis*, and F. Mueller observes (in a letter to Bentham) that they are so in the Tasmanian *P. communis*; whereas in the tropical Australian plant which Bentham includes under it they are evergreen."

If botanists are anxious to keep up the distinction between the two former species, the only thing to do is to make as many or more forms.

Vernacular name : Narkul

Etymology : *Phragmites* is taken from Dioscorides and means fit for railings. The Greeks, as even the Venturians at the present day, used reeds for enclosures.—*Maxima* means very tall.

Description : Stems erect, 120 cm to 3 m high, sometimes much taller or dwarfed, smooth, simple or branched, covered with the leaf-sheath. Leaves close, bifarious, linear, acuminate, reaching up to 4 cm broad, coriaceous, smooth, base contracted, margins smooth, sheaths loose, glabrous, the mouth auricled, ligule a ciliate line.

Panicle up to 60 cm long, erect, oblong, branches widely spreading, filiform. Spikelets when fully expanded about 12 mm broad across the glumes; pedicels capillary, smooth; callus densely clothed with long silky hairs. Glumes glabrous, lower involucral glume 3-5 mm. long, oblong-lanceolate or linear, acute, 3-nerved, upper involucral glume 4-6 mm. long, oblong-lanceolate, acute, 3-nerved, lower floral glume 4-10 mm. long; upper floral glume equally long or rather longer than the lower. Palea about 2.5 mm long, linear-oblong. Anthers about 3 mm. long.

Locality : Sind - Ketī (Blatter & McCann D652! D653!); Tatta, Kullān Kōte Lake (Blatter & McCann D654!).

Cutch - Anjar (Blatter 3740!).

Gujarat - Mahals-Dangs, by a stream, 800 ft., rainfall 100 in. (Sedgwick & Bell 5390!).

Khandesh - Bhusawal, N.-E. Tapti River (Blatter & Hallberg 4436), Chanseli Hill, north slope, watercourse (McCann A44! A45!).

Deccan - Dhond (Woodrow).

S. M. Country : Banks of Warda River, Bangalore Road, 1,800 ft., rainfall 33 in. (Sedgwick 2092!); Haveri (Talbot 2178! 2198!).

N. Kanara - Supa, 2,100 ft. (Talbot 2195!).

Ecology : Grows chiefly near the margins of rivers and lakes, and in low wet places.

Distribution : Cosmopolitan

Economic uses : A good plant for binding loose soils. The young grass is sometimes eaten by cattle, but generally too coarse for fodder purposes. It is mentioned that this grass has proved poisonous to cattle in Kumaon. The stems are used for making baskets, chairs, hurdles and screens.

*70. *ARUNDO* Linn.

Tall, stout, perennial grasses with broad linear blades and large plume-like terminal panicles. Spikelets 2-7-flowered, laterally compressed, in large decompound panicles; flowers mostly bisexual; rachilla disarticulating above the involucrel glumes and between the flowering glumes, joints short, glabrous. Involucrel glumes equal, broadly lanceolate, shortly acuminate, keeled, membranous, 3-5-nerved. Floral glumes more or less equalling the involucrel glumes, ovate to lanceolate-ovate, acuminate, finely bifid or entire, long-hairy below, 5-9-nerved, 3 nerves more or less percurrent or excurrent, the rest short, the middle nerve often produced into a short fine bristle, callus short, shortly bearded. Paleae slightly exceeding $\frac{1}{2}$ the length of the floral glume, 2-keeled. Lodicules 2, obovate, nerved, glabrous. Stamens 3. Ovary glabrous; styles distinct, almost as long as the laterally exerted plumose stigmas. Grain obovoid-oblong, broad, loosely enclosed in the floral glume and palea, hilum basal, punctiform; embryo occupying almost wholly one side of the grain.

Species 12.—Tropical and temperate regions.

*1. *ARUNDO DONAX* Linn.

Arundo Donax Linn. Sp. Pl. (1753) 81; Duthie Grasses N. W. Ind. (1883) 35, Fodder Grasses N. Ind. (1888) 60; Lisboa Bomb. Grasses (1896) 115; Hook. f. Fl. Brit. Ind. VII (1896) 302.

A. benghalensis et bifaria Retz. Obs. IV (1786) 22, V, 20, Roxb. Fl. Ind. I (1832) 347, 348.

A. longifolia Salisb. Prodr. 24.

A. sativa Lam. Fl. Franc. III, 616.

Donax arundinaceus Beauv. Agrost. (1812) 78, t. 16, fig. 4.

D. benghalensis Beauv. l. c.

D. bifarius Trin. in Spreng. Neue Entdeck. II, 73.

Amphidonax bengalensis Nees ex Steud. Syn. Pl. Glum. 197.

A. bifaria Nees ex Steud. l. c. 410

Scolochloa arundinacea Mert. & Koch. Fl. Germ. I, 529.

Ara benghalensis Gmel. Syst. I, 174.

Vernacular name : Giant Reed.

Etymology : *Arundo* is the collective name of the Romans for various reeds.—*Donax* means reed, from the Greek *doneo*, I move, alluding to the fact that the plant is moved about by the wind.

Description : Stem creeping below, erect, 1-6 m. high, smooth, hollow, very many-noded, simple or scantily branched, internodes slightly exceeded by the sheaths, these very tight, firm, smooth. Blades linear-lanceolate from a broad base, long-tapering to a very fine point, more or less drooping, 30-60 cm. long, 2-5 cm. broad, smooth.

Panicles erect, 30-60 cm. long; branches scaberulous, erect or drooping; spikelets 8-10 mm long, light brown. Involucrel glumes glabrous, floral ones 6-10 mm. long; hairs 5-6 mm long. Anthers 3 mm long. Grain 2-5 mm. by almost 1 mm.

A smaller variegated form with white-striped leaves is cultivated (*var. variegata*).

Locality : Often grown in gardens.

Ecology : A hygrophylous species.

Distribution : Lower Himalaya, Punjab, Naga, Nilgiri and Coorg Hills, N. Asia, N. Africa, Europe.

TRIBE VII : Agrostaceae.

Floret 1. Rachilla not continued beyond the floret or only as a more or less distinct point or bristle. Floral glume membranous or thinly herbaceous, not or hardly changed when mature, usually truncate, 5- (very rarely 3-) nerved, all the nerves or the outer side-nerves often slightly excurrent, parallel or at least not anastomosing; awn, if present, from the back, rarely from the truncate tap.

See key page xviii.



Detm.: R. K. Bhu

HELOPOCHLOA SETULOSA BLATTER & MCCANN



71. HELEOCHLOA Host

Rigid annual or perennial erect or prostrate grasses. Leaves flat or convolute

Spikelets 1-flowered, densely imbricate, in cylindric spike-like panicles laterally compressed, rachilla not produced beyond the floral glume. Glumes 3, scarious, the involucrel glumes subequal or the lower shorter, keeled, 1-nerved, persistent; floral glume equalling the upper involucrel glume or longer, ovate or oblong, loosely 1-nerved, enwrapping the grain, membranous; palea oblong, obtuse or 2-fid, 2-nerved. Lodicules 2. Stamens 2 or 3. Styles elongate. Grain ovoid or ellipsoid, loose in the glume and palea.

Species 8.—Mediterranean-oriental.

1. Panicles less than 2.5 cm. long 1. *H. schoenoides*.
2. Panicles reaching 8 cm. 2. *H. setulosa*

1 HELEOCHLOA SCHOENOIDES Host.

PLATE 133.

Heleochloa schoenoides Host Gram. Austr. I (1801) 23, t. 30, Boiss Fl. Or. V (1884) 476; Duthie Fodder Grasses N. Ind. (1888) 48, Lisboa Bomb. Grasses (1896) 93; Hook. f. Fl. Brit. Ind. VII (1896) 235; Cooke Fl. Bomb. II (1908) 1011

Cryptis aculeata Duthie Grasses N. W. Ind. (1883) 25, Fodder Grasses N. Ind. (1888) 45, t. 62.

C. schoenoides Lam. III I, 166, t. 42, fig. 1, Duthie Grasses N. W. Ind. (1888) 25.

C. compacta Steud. Syn. Fl. Glum. 151

C. nilavca Fresen. & De Notar. in Mem. Acad. Tor. ser. II, XIV (1854) 322.

C. vaginiflora Opiz Natural. VIII (1824) 83.

Phalaris vaginiflora Forsk. Fl. Aeg.-Arab. (1775) 18.

Phleum schoenoides Linn. Sp. Pl. (1753) 60.

Spartina phleoides Roth Neue. Beytrag. I, 101.

Pectea sub-cylindrica Pourr. Chlor. Narb. no. 103.

Etymology : *Heleochloa* is derived from *helios* the sun, and *chloa*, a grass, very likely a habitat name—*Schoenoides* means resembling *Schoenus*, a genus of *Cyperaceae*.

Description : Annual, stems prostrate, spreading in a circle round the root, 2.5-15 cm, long, glabrous, smooth, more or less striate, rigid, nodes glabrous. Leaves 2.5-5 cm. long narrowly lanceolate, acuminate, sheaths more or less inflated, ribbed, hairy at the mouth and with membranous (sometimes ciliate) margins, ligule a dense ring of long slender hairs.

Inflorescence a spike-like ovoid-oblong, compressed panicle 13-20 mm. long, sessile on the greatly dilated sheath of the uppermost leaf. Spikelets densely imbricate, 3-2 mm. long. Glumes 3, lower involucrel glume 2.5 mm long, linear-lanceolate, folded, glabrous except for the ciliate keel, scarious, 1-nerved, upper involucrel glume a little longer than the lower, ovate-lanceolate, acute, scarious, with ciliate keel, 1-nerved, floral glume nearly 3.2 mm long, broadly ovate, acute, membranous, 1-nerved, the keel nearly glabrous; palea oblong, obtuse. Stamens usually 3, filaments very long, not thickened at the base, anthers small. Grain 1.2 mm. long, oblong-ellipsoid, compressed.

Locality : Sind. Bhubak (Cooke!).

Ecology : A halophytic species.

Distribution : Punjab, W. Himalaya, Kashmir, Bundelkhand, westwards to the Atlantic.

Explanation of Plate 133 : *Heleochloa schoenoides* Host.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Grain.

2. HELEOCHLOA SETULOSA Blatter & McCann, nov. comb.

PLATE 134.

Vulfa setulosa Trin. in Mem. Acad. Petersb. ser. VI, V, II (1840) 55.

Heleochloa dura Boiss. Fl. Or. V (1881) 477; Lisboa Bomb. Grasses (1896) 93; Hook. f. Fl. Brit. Ind. VII (1896) 236; Cooke Fl. Bomb. II (1908) 1011.

Cryptis dura Boiss. Diagn. ser. II, IV (1859) 125.

C. phalaroides Duthie Grasses N. W. Ind. (1883) 25 (non M. Bieb.).

Etymology : *Setulosa* means minutely pubescent

Description : Perennial, pale, clothed all over with minute velvety pubescence; stems stout, ascending, 15-25 cm. long, densely fastigate from a woody inclined base which is clothed

with leaf-sheaths, about 2.5 mm. diam., hard, few-leaved; nodes glabrous. Leaves 7.5-15 cm. long, involute, terete, rigid, pungent, sheaths short coriaceous, glabrous; ligule a narrow line of hairs.

Inflorescence a spike-like panicle reaching 9 cm. by 4 mm, solitary at the top of the stem. Spikelets densely imbricate, 2.5 mm. long. Glumes 3, all 1-nerved and with ciliate keels; lower involucre glume 1.6 mm long, linear-oblancoelate, acute, apiculate, upper involucre glume 2 mm long, linear-oblancoelate, apiculate, floral glume 2.5 mm. long, elliptic-oblong, obtuse, mucronate, palea 2 mm long, 2-fid, with obtuse ciliate lobes, 2-nerved. Stamens usually 2, less commonly 3; filaments very long, thickened at the base, anthers short.

Locality : *Sind* : Salt water creeks (Stocks 455); Gholam, in Indus Delta (Blatter & McCann D688¹).

Kathnawar : Dwarka (Borgesen).

Ecology : Grows generally in salt water creeks.

Distribution : *Sind*, Arabia.

Explanation of Plate 134 : *Heleocholea setulosa* Blatter & McCann.

- 1 Spikelet.
2. Lower invol glume.
3. Upper invol glume.
4. Floral glume
- 5 Palea of floral glume
6. Stamens, ovary and styles.

72. GARNOTIA Brogn.

Erect, perennial (rarely annual), stout or slender grasses. Leaves flat or convolute.

Spikelets paniculate, very small, narrow, terete, 1-flowered, solitary or 2-nate, jointed on their pedicels, rhachilla not produced beyond the floret. Glumes 3, involucre glumes subequal, lanceolate, acute, acuminate or awned, strongly 3-nerved, empty; floral glume as long as the involucre glumes, lanceolate, acuminate or awned, thinly coriaceous or membranous, quite smooth, faintly 1-nerved, paleate, 2-sexual, tip acute or minutely 2-dentate, awn rarely jointed, sometimes geniculate, slender, scaberulous; palea as long as the glume, linear, the lobes, minutely auricled at the base. Lodicules 2. Stamens 3; anthers linear. Styles free; stigmas with simple hairs, laterally exerted. Grain linear or oblong, dorsally compressed, free within the glume and palea.

Species 12 ---Indo-Malaya, China, Japan.

- | | | | | |
|---|---------------------------------|-----------------------|---|------------------------|
| 1 | 5-20 cm. high, growing on trees | Leaves 2.5-5 cm. long | . | 1. <i>G. arborum</i> . |
| 2 | 30-60 cm. high. | Leaves 7-20 cm long | . | 2. <i>G. stricta</i> . |

1. GARNOTIA ARBORUM Stapf

PLATE 135.

Garnotia arborum Stapf ex Woodrow in Journ. Bomb. Nat. Hist. Soc. XIII (1901) 439; Cooke Fl. Bomb. II (1908) 1013

Etymology : *Garnotia* is commemorative.

Description : A low stiff erect annual grass 5-20 cm. high, growing on trees amongst moss; stems tufted, terete, smooth, shining, glabrous, often tinged with red, nodes pubescent. Leaves 2.5-5 cm. by 1.6-3.2 mm, linear, acuminate, glabrous, sheaths glabrous, striate, ligule a narrow lacerate membrane.

Inflorescence paniculate; branches 2-3, fascicled on the rhachis, the clusters 6-20 mm. apart, angular, stout, truncate. Spikelets 1-flowered, articulate on the ends of the branches, early deciduous. Lower involucre glume 2.5-3.2 mm. long, membranous, 3-nerved, the nerves hispid, the midrib produced into an awn equalling the glume or less, upper involucre glume similar; floral glume nearly equalling the involucre glumes, but more coriaceous, 2-toothed, with an awn 20 mm. long from between the teeth, obscurely nerved; palea hyaline, slightly smaller than the glume, acute, with large flaps at the base, nerveless. Stamens 3; anthers 0.6 mm. long. Grain 2.5 mm. long, ovoid-lanceolate, acute at the apex, rounded at the base.

Locality : *W. Ghats* : Igatpuri (McCann 4598¹); Khandala (McCann¹); Lonavla (Gammie 15501¹); on trees at Nandgaon, on the crest of the Ghats, 10 miles S. of Lonavla, (Woodrow 30); Lingmala, near Mahabaleshwar, on tree (McCann 3412¹).

Deccan : Kalsubai Hill, under a steep rock (Patwardhan 1189¹).

At Khandala we have observed this species covering roofs completely to the exclusion of everything else.

Distribution : Apparently endemic.



GARNOTIA ARBORUM STAPF.

Drawn R. K. Bhide



Explanation of Plate 135 : *Garnotha arborum* Stapf.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume
5. Palea of floral glume.

2 GARNOTIA STRICTA Brogn.

PLAT 136.

Garnotha stricta Brogn in Duperr. Voy. Bot. (1829) 133, t. 21, Hook f. Fl. Brit. Ind VII (1896) 243, Cooke Fl. Bomb II (1908) 1013.

G. sandwicensis Hillebr Fl. Hawaii (1888) 513.

Ara Griff Not III, 56, Ic Pl Asiat. t. 145

Description : Annual ? , stems 30-60 cm. long, tufted, geniculate and often branched at the base, smooth, glabrous. Leaves 7.5-20 cm. by 2.5-10 mm, lanceolate or linear-lanceolate, glabrous or hirsute, or scabrous above, the margins flat or hirsute, sheaths usually glabrous, ligule a narrow ciliate membrane.

Panicle 5-20 cm long, very narrow, branches in distant fascicles, scaberulous. Spikelets pale, 2.5-3.2 mm. long, sparsely hairy at the base. Lower involucre glume ovate-lanceolate, finely acuminate, 3-nerved, the midnerve sometimes excurrent, upper involucre glume similar; floral glume entire or notched, usually awned, the awn 13 mm long or less.

Locality : Konkan. Pen (McCann 5501 !), Kalyan (Talbot !), between Neral and Karjat (Woodrow)

W Ghats : Khandala, St. Mary's Villa, on roof (McCann A299 !), Igatpuri (McCann 4589 !), Panchgani (Blatter & Hallberg B1283 ! B1305 !).

N. Kanara. Top of Guddehalli (Hallberg & McCann A303 !), Gersoppa Falls (Hallberg & McCann A300 !)

Distribution : Himalayas, Khasia Hills, Bihar, W Peninsula, Sandwich Islands.

Explanation of Plate 136 : *Garnotha stricta* Brogn.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume
4. Floral glume
5. Palea of floral glume.
6. Stamens, ovary and styles

73 POLYPOGON Desf.

Annual or perennial, usually decumbent grasses, with flat blades

Spikelets 1-flowered, minute, jointed (but persistent) on the pedicels, laterally compressed, keeled, densely crowded on the short branches of a spiciform or lobed panicle, rhachilla not produced beyond the lower floral glume. Glumes 3. Involucral glumes equal, concave, keeled, bifid, notched or entire, with a slender awn below the tip or in the sinus. Lower floral glume much smaller, hyaline, sessile, truncate, toothed, awned or not; palea small, 2-nerved. Lodicules 2, falcate. Stamens 1-3; anthers small. Ovary glabrous; styles free. Grain obovoid, free within the glume and palea.

Species about 10.—All warm regions.

1 POLYPOGON MONSPELIENSIS Desf.

PLATE 137.

Polygomon monspeliensis Desf Fl. Atlant. I (1798) 66, Duthie Grasses N. W. Ind (1883) 30, Fodder Grasses N. Ind (1888) 50, Lisboa Bomb. Grasses (1896) 94; Hook f. Fl. Brit. Ind. VII (1896) 245

P. cruentus Duthie l. c. (*crinitus* per errorem).

P. maritimus Duthie l. c. (non Willd.).

P. nepalensis Nees ex Steud. Nom. ed. 2, II (1840) 378, Duthie l. c. 30.

P. fugax Nees ex Steud. l. c.; Duthie Fodder Grasses N. Ind. (1888) 51

P. panicus Lag. Gen. et Sp. Nov. 3.

P. polysetus Steud. in Flora XII (1829) 467.

P. zeylanicus Nees ex Steud. Syn. Pl. Glum. 182.

Agrostis alopecuroides Lam. Ill. 812.

A. crinita Moench Meth. (1794) 178.

- A. panicea* Willd. Sp. Pl. I, 128
A. traristata Knapp Gram. Britt. t. 23.
Cynosurus paniceus Linn Sp. Pl. (1753) 73.
Phleum crinitum Schreb. Gram. I, 151, t. 20, fig. 3; Roxb. Fl. Ind. I (1832) 313.
P. monspeliense Koel. Descr. Gram. 57.
Alopecurus aristatus Gouan Hort. Monsp. 37
Al. monspeliensis Linn Sp. Pl. (1753) 61.
Al. paniceus Linn Sp. Pl. ed. II, 90
Phalaris cristata Forsk. Fl. Aeg.-Arab. (1775) 17.

Vernacular names : Chutra, Malhar.

Etymology : *Polypogon* is derived from *polys*, much, and *pogon*, beard — *Monspeliensis* after Montpellier, an old university town of France

Description : Stems tufted, 10-60 cm. high, stout or slender, leafy, base geniculate. Leaves 7-15 by 3-6 mm., green, ligule oblong

Panicle 1-15 cm. by 6-10 mm. broad, pale yellowish green, silky, sometimes lobulate from the projecting branches. Spikelets 1-2 mm. long, minutely pubescent, very shortly pedicelled. Involucral glumes very variable in breadth, obovate-oblong, sides scaberulous, keels scabrid, margins ciliate, tip entire, notched or very shortly 2-fid; awns from the length of the glume to 8 mm long, excessively delicate. Lower floral glume very small, oblong, glabrous, 2-fid, awned or not, palea oblong, tip notched. Anthers very minute, short. Ovary ovoid.

Locality : *Sind* : Sukkur (Bhude !); Shikarpur (Bhude !)

Ecology : Common in cultivated ground.

Distribution : Tropical and temperate regions.

Economic uses : This grass is of little value as fodder.

Explanation of Plate 137 : *Polypogon monspeliensis* Desf.

1. Spikelet.
2. Lower invol. glume
3. Upper invol. glume
4. Lower floral glume
5. Upper floral glume.
6. Grain.

TRIBE VIII: Stipeae.

Floret 1. Rhachilla not continued beyond the floret. Floral glume hardened when mature, tightly enveloping the fruit; nerves joining or closely approaching at the tip; awn terminal, rarely 0.

See key page xviii

74. ARISTIDA Linn.¹

Annual or perennial tufted grasses. Leaves flat or convolute.

Spikelets panicle, 1-flowered, not articulate on their pedicels, laterally compressed; rhachilla not produced beyond the flowering glume. Glumes 3; involucral glumes very narrow, long, 1-nerved, keeled, persistent, with or without a terminal awn, floral glume very narrow, cylindric, coriaceous, 3-nerved, tipped by 3 very long capillary awns (the 2 lateral awns occasionally short or obsolete); callus long articulate at the base; palea minute, convolute round the ovary and grain. Lodicules 2, long, narrow, hyaline. Stamens 3; anthers long, narrow. Styles free, short, stigmas penicillate, laterally exerted. Grain long, narrow, cylindric, free in the convolute closely enveloping glume.

Species about 320¹ Tropical and temperate parts of the world.

Cooke describes 7 species. We retain them and add *Aristida mutabilis* Trin. & Rupr. and *A. pogonophala* Boiss

A. Awns without column.

I. Involucral glumes not awned 1. *A. Adscensionis*.

II. Involucral glumes awned.

- | | |
|-----------------------------------|--------------------------|
| 1 Spikelets 16 mm. long | 2. <i>A. setacea</i> . |
| 2. Spikelets 10 mm. long. | 3. <i>A. Hystriz</i> . |
| 3 Spikelets 6 mm. long | 4. <i>A. mutabilis</i> . |

¹ We shall have to refer repeatedly to the splendid monographs by J. Th. Henrard : "A critical Revision of the genus *Aristida* in Mededeel van s'Rijks Herbarium," Leiden no. 54 (1926), no. 54 A (1927) and "A Monograph of the Genus *Aristida*" vol. I (not dated).



POLYPOGON MONSPELIENSIS DESF

Desf.: E. K. Bide.



ARISTIDA ADSCENSIONIS LINN.

Dehn; B. K. B.

B. Awns with a column.

I. Column of awn articulate on the floral glume.

1. Awn plumose.

- a. Glumes glabrous Central awn without
a naked tip 5. *A. pogonoptila*.
b. Glumes not glabrous. Central awn
with a naked tip 6. *A. hirtigluma*.

2. Awn not plumose.

- a. Stems less than 15 cm. high Lower
involucral glume 5 mm. long . . . 7. *A. hystriacula*.
b Stems reaching 60 cm. high. Lower in-
volucral glume 22 mm. long . . . 8. *A. funiculata*.

II. Column of awn not truly articulate on the floral glume,
though readily separating 9. *A. redacta*.1. *ARISTIDA ADSCENSIONIS* Linn

PLATE 138.

- Aristida Adscensionis* Linn Sp. Pl (1753) 82, Kunth Enum Pl. I, 190; Steud. Syn. Pl. Glum. (1855) 139; Hook f. Fl. Brit. Ind VII (1896) 224, excl. synonymis aliquibus; Cooke Fl. Bomb. II (1908) 1008.
A. abyssinica Trin. & Rupr. Sp. Gram. Stap. in Act. Acad. Petrop. ser. VI, V (1842) 134.
A. canariensis Willd Enum (1809) 99.
A. modatica Steud Syn. Pl. Glum (1855) 139
A. curvata Nees var *abyssinica* Rich. Tent. Fl. Abyss II (1851) 392.
A. divaricata Jacq. Eclog. Gram. (1813) 7, t. 6 (non Humboldt et Bonpl. nec Lagarcea).
A. Heymanni Regel in Act. Hort. Petrop VII, 2 (1881) 649
A. hystrix Duthie Fodder Grasses N. Ind (1888) 47, t. 31 (non Linn. f.).
A. aethiopica Trin. & Rupr l. c. (1842) 134, non 167 sicut habet Hook. f.
A. Adscensionis Linn var *aethiopica* Hook. f. Fl. Brit. Ind. VII (1896) 225.
A. Ehrenbergii Trin. & Rupr l. c. (1842) 136.
A. Adscensionis Linn. var *Ehrenbergii* Henrard in Meded. Rijks Herb. I (1926) 158.
A. festucoides Poir. Encyclop. I (1810) 453.
A. Adscensionis Linn. var *festucoides* Henrard l. c. I (1926) 177.
A. Adscensionis Linn. var *angustifolia* Pilger in Henrard l. c. I (1926) 9.
A. Adscensionis Linn var. *typica* Stapf in Hook f. Fl. Brit. Ind. VII (1896) 224.
A. Adscensionis Linn var. *bromoides* Henrard l. c. I (1926) 62.
A. coarctata H. B. K. Nov. Gen. et Sp. I (1815) 122.
A. debilis Mez. in Fedde Rep. sp. nov. XVII (1921) 151
A. fasciculata Torrey in Ann. Lye Nat. Hist. New York I, pt. 1 (1824) 154.
A. Grisebachiana Fournier Nex. Pl. pt. II, Gram. (1881) 78.
A. Adscensionis Linn. subsp. *guineensis* Henrard l. c. I (1926) 216.
A. Hermannii Mez in Fedde Rep. sp. nov. XVII (1921) 153.
A. Adscensionis Linn var. *humilis* Henrard l. c. (1927) 247.
A. interrupta Cav. Ic. V. (1799) 45, t. 471, fig. 2.
A. luzoniensis Cav. Ic. V. (1799) 45, t. 470, fig. 2.
A. Adscensionis Linn. var. *condensata* Henrard l. c. II (1927) 318.
A. macrochloa Hochst. in Flora XXXVIII (1855) 200.
A. maritima Steud. Syn. Pl. Glum. (1855) 137.
A. mauritiana Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 392.
A. mongholica Trin. et Rupr l. c. (1842) 133.
A. nana Steud Syn. Pl. Glum. (1855) 137.
A. nigrescens Presl Reliq. Haenk. I (1830) 223.
Chaetaria canariensis P. Beauv. Agrost. (1812) 30.

The above is a list of synonyms which have been included by Henrard under *A. Adscensionis* Linn. either as representing the typical plant or as subspecies and varieties.

The following is a list of synonyms which Hook. f. in the F. B. I. (VII, 224, 225) had cited under *A. Adscensionis*, but which have to be excluded according to Henrard's recent investigations.

Aristida coerulescens Desf. Fl. Atl. I (1798) 109, t. 21, fig. 2, treated as a distinct species by Henrard I, 99.—*A. chaetophylla* Steud. Syn. Pl. Glum. (1855) 420, no. 108b.—*A. depressa* Retz.

Obs IV (1786) 22 (ex Henrard I, 136).—*A. elator* Cav. Ic. VI (1799) 65, t. 581, fig. 1 (non Deell.), put by Henrard (p. 161) under *A. coerulescens* Desf.—*A. gigantea* Linn. f. Suppl. (1781) 113. Henrard (I, 199) is doubtful about the identity of this species, as he has not seen the type.—*A. Jacquiniana* Tausch, in Flora II (1836) 508, considered by Henrard (II, 268) as a distinct species.—*A. paniculata* Forskal in Fl. Aegypt.—Arab. (1775) 25. Hook. f. considers it to be identical with *A. Adscensionis* "ex descript." Trinius, however, observes that Forskal's diagnosis agrees with nearly all the *Aristidas* with naked awns. Before we can find Forskal's type it will be impossible to place his plant with anything like certainty. (See Henrard II, 418).—*A. mutabilis* var. *aequilonga* Trin. & Rupr. l. c. (1842) 150. Henrard l. c. II (1827) 366 retains *A. mutabilis* as a distinct species and considers the specimen mentioned under the variety *aequilonga* as the type-specimen of *A. mutabilis*.—*Chaetaria coerulescens* P. Beauv. Roem. & Schult. Syst. II, 294, identical with *A. coerulescens* Desf.—*C. depressa* P. Beauv. Agrost. 30.—*C. elator* P. Beauv. Agrost. 30.—*C. gigantea* P. Beauv. Agrost., doubtful.

Vernacular names : Motti-burri, Longi-kussal, Lani.

Etymology : *Aristida* is derived from *arista*, an awn, alluding to the flowering glume which is usually tipped by 3 capillary awns.—*Adscensionis* refers to Ascension Island in the South Atlantic Ocean.

Description : Annual or perennial; stems 23-60 cm. long, densely tufted, very slender, erect or ascending, simple or branched; branches erect, smooth. Leaves 7.5-30 cm. by 1.2 mm., convolute, filiform, smooth or scaberulous, sheaths smooth, with rounded auricles; ligule of fine short hairs.

Panicle 7.5-30 cm. long, contracted, subseund; rachis filiform, smooth; branches short; pedicels short, capillary. Spikelets erect, 6-8 mm. long. Lower involucre glume 4 mm. long, oblong-lanceolate, acute, membranous, often purple with a scaberulous keel; upper involucre glume lanceolate, 6 mm. long, 2-toothed and apiculate at the tip, the keels smooth; floral glume 8 mm. long, 3-nerved, smooth; awns 3, not articulate on the glume, the middle one larger than the lateral, 10-20 mm. long; callus long, pointed, hairy at the base; palea minute, oblong, hyaline, retuse.

NOTE—Cooke includes under *A. Adscensionis* the plant called *A. depressa* Retz. Obs. IV (1786) 22 by Dair. & Gibs. in their Flora of Bombay, and stated by them to occur 'on dry hills.' Neither Cooke nor we have seen the specimen and so we cannot know whether it is the real *Aristida depressa* of Retz. or whether it belongs to *A. Adscensionis*. If it is Retz's species we would have to add *A. depressa* Retz. to the Bombay Flora, as it is considered to be a species distinct from *A. Adscensionis*.

For the benefit of botanists who wish to clear up this point we quote from Henrard p. 137, when he points out the difference between the two species. "Well-developed plants (of *A. depressa*) have sterile innovation-shoots but the root-system is rather faint and much resembles that of annual grasses. The blades are thin and setaceously convolute and the panicles are very loose and open. The spikelets differ from those of *A. Adscensionis* in the very unequal length of the glumes, the lower glume is about $\frac{1}{2}$ as long as the upper and both are moreover very acute, the lower distinctly awned, the upper without a bifid apex and slightly pointed."

Locality : *Sind* : Laki (Bhide !); Sehwan to Laki, foot of hills (Sabnis B612 !); Umarkot, sand dunes (Sabnis B1075 !); Tatta (Blatter & McCann D626 !), Kullian Kote Lake (Blatter & McCann D625 !).

Cutch : Bhuj Hill (Blatter 3769 !).

Kathiawar : Jetalisar (Woodrow 43).

Gujarat : Ahmedabad (Saxton 1066 !); road to Lasandra (Chibber !); Sevalia (Chibber !); road to Gogka (Chibber !).

Khandesh : Bor, Tapta River (Blatter & Hallberg 5412 !); Toranmal (McCann A230 !).

W. Ghats : Panchgani (Blatter & Hallberg B1315 !).

Deccan : Pashan (Gammie !); Manmad (Blatter 9973 !); Happy Valley, Ahmednagar Dist. (Chibber !); Poona (Cooke, Woodrow); Bowdhan Hill near Poona (Woodrow 38).

S. M. Country : Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4346 !); Haveri (Talbot 2181 !), Ranibennur (Jouvhat !); Gokak Hills (Bhide !).

Ecology : A subgregarious species. Common on dry land.

Distribution : Most warm countries.

Economic uses : As to the value of this species as a fodder grass opinions are very much divided. See Lasboe 91.

Explanation of Plate 138 : *Aristida Adscensionis* Linn

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.



ARISTIDA SETACEA RETZ.

Delin: B. K. Bhade.



ARISTIDA HYSTRIX LINN. F.

Detm: B K

4. Floral glume.
5. Stamens, grain and styles.
6. Lodicules.

2. *ARISTIDA SETACEA* Retz.

PLATE 139

Aristida setacea Retz. Obs. IV (1786) 22, Roxb. Fl. Ind. I (1832) 349, Grah. Cat. Bomb. Pl. (1839) 218, Dalz. & Gibs. Bomb. Fl. (1861) 295, Duthie Grasses N. W. Ind. (1883) 27; Lisboa Bomb. Grasses (1896) 91; Hook. f. Fl. Brit. Ind. VII (1896) 225; Cooke Fl. Bomb. II (1908) 1008; Haines Bot. Bih. and Or. (1924) 977.

A. Hystrix Bak. Fl. Maurit. (1877) 451 (excl. syn.).

A. quinqueseta Steud. Syn. Pl. Glum. (1855) 420.

Vernacular names : Mothu Kussal.

Description : Perennial, stem 60-90 cm. high, stout, erect or geniculately ascending from a woody base, with stout wiry root-fibres, hard, smooth and polished, simple or subsistigately branched. Leaves 15-30 cm. by 2-4 mm, usually convolute, coriaceous, smooth, sheaths long, smooth; ligule of short hairs

Panicle various, 15-30 cm long, inclined, sometimes subsecond, open or contracted; rachis slender, smooth, branches long or short, the lower sometimes reaching 10 cm. long, filiform or capillary, usually fascicled and erect. Spikelets 16 mm. long (excluding awns), erect, pedicels capillary. Lower involucre glume awned, 16 mm. long (including an awn of 4 mm long), 1-nerved, upper involucre glume a little longer than the lower (with an awn about 4 mm. long), notched at the insertion of the awn, and with hyaline margins, 1-nerved; floral glume 16 mm. long, 3-nerved, awns 3, inarticulate at the base, 2.5-3.2 cm. long, subequal or the middle the longest, callus long, bearded with long hairs. Stamens 3; anthers 4 mm. long.

Locality : Kathwar. Rajkot (Woodrow).

Khandesh. Dadgaum (McCann 9764 !).

Konkan. Vetora (Sabnis 33677 !), Vengurla, seacoast (Chibber !); Salsette (Graham).

W. Ghats. Khandala (Graham).

Deccan. Manmad (Blatter 229 !); Ganeshkhind Bot. Gardens (Patwardhan !).

S. M. Country. Kappatgudd Hills, 2,600 ft., rainfall 30 in. (Sedgwick & Bell 5217 !); Dharwar, 2,500 ft., rainfall 34 in. (Sedgwick 1822 !); dry hills and fields north of Dharwar (Sedgwick 3778 !); Byadgi (Talbot 1759 !), Badam (Bhide !).

N. Kanara. Karwar, common (Sedgwick & Bell 5065 !), Halyal (Talbot 2161 !).

Ecology : A sporadic species, growing on dry hilly ground.

Distribution : Bihar, W. Peninsula, Mascarene Islands.

Economic uses : Useless as fodder, cattle do not eat it. The long wiry stems are used for tattles and brooms. A very troublesome grass for those who have to walk through it.

Explanation of Plate 139 : *Aristida setacea* Retz.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Stamens and grain.
6. Lodicules.

3. *ARISTIDA HYSTRIX* Linn. f.

PLATE 140.

Aristida Hystrix Linn. f. Suppl. (1781) 113 (non Thunbg); Roxb. Fl. Ind. I (1832) 350; Graham Cat. Bomb. Pl. (1839) 335; Dalz. & Gibs. Bomb. Fl. (1861) 295; Hook. f. Fl. Brit. Ind. VII (1896) 225, Cooke Fl. Bomb. II (1908) 1009.

Chaetara Hystrix Beauv. Agrost. (1812) 30.

Vernacular names : Pawn-burri, Matari-Kussal (old woman's hair), Kale kussal.

Etymology : *Hystrix*, porcupine.

Description : Perennial; stems 15-60 cm., long, from a creeping rootstock, diffuse, ascending, sometimes proliferously branched. Leaves rather glaucous, 3-8-10 cm. by 1.6-3.2 mm. convolute; sheaths glabrous striate; ligule of soft hairs.

Panicle 10-15 cm. long and as broad as long, rigid; rachis stout, flexuous and angular; branches and branchlets smooth. Spikelets (excluding awns) 10 mm. long, straw-coloured.

Lower involucre glume 10 mm. long (including awn), lanceolate, acuminate, 1-nerved, with an awn of 1.6 mm. long, chartaceous; upper involucre glume more than 13 mm. long (including an awn of 1.6 mm. long), lanceolate, acuminate, chartaceous, 1-nerved, quite glabrous, minutely toothed at the tip at the base of the awn; floral glume 10 mm. long; callus 1.6 mm. long, pointed, shortly villous; awns 3, not articulate with the glume, subequal or the middle one sometimes the longest, scabrid.

Hooker f.'s statement (l. c.) that the callus is naked is not correct. Cooke (l. c.), however, is right when saying that it is shortly villous.

Locality : Gujarat : Daman, on sand hills (Bhide !).

S. M. Country : Tadas, dry hillsides, 2,000 ft., rainfall 35 in. (Sedgwick 3823 !); Dharwar (McCann !, Sedgwick !); Haveri (Talbot 2182 !); Badami (Bhide !, Cooke, Woodrow).

Ecology : A sporadic grass. A xerophyte and flowers almost the whole year round. Common in dry stony places.

Distribution : Central Provinces, W. Peninsula.

Economic uses : Eaten by cattle when young, otherwise not much used as a fodder grass.

Explanation of Plate 140 : *Aristida Hystrix* Linn. f.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea and lodicules.
5. Spikelet.

4. *ARISTIDA MUTABILIS* Trin. & Rupr.

Aristida mutabilis Trin. & Rupr. in Mem. Acad. Petersb. ser. VI (1842) 150; Hook. f. Fl. Brit. Ind. VII (1896) 226, excl. *ahquib*. syn.

A. articulata Edgew. in Journ. Proc. Linn. Soc. VI (1862) 209; Aitchis. Cat. Panjab Pl. (1869) 164; Duthie Grasses N. W. Ind. (1883) 26, Fodder Grasses N. Ind. (1888) 47.

A. mutabilis Trin. & Rupr. var. *tangensis* Henrard l. c. II (1927) 368.

A. longeradiata Steud. Syn. Pl. Glum. (1855) 140.

A. hoggarimensis Batt. & Trin. Bull. Soc. Bot. Fr. Tome. LIII, série IV, Tome VI (1906) Sess. extraor. avril 1906, p. XXXII.

A. mutabilis Trin. & Rupr. var. *hoggarimensis* Henrard l. c. II (1927) 239.

The following synonyms given by Hook. f. l. c. must be excluded : *Aristida Kunthiana* Trin. & Rupr. in Mem. Acad. Petersb. ser. VI (1842) 151, a distinct species.—*Aristida meccana* Hochst. ap. Trin. & Rupr. l. c. 152, a distinct species.

Etymology : *Mutabilis* means changeable.

Description : An annual grass. Stems 15-30 cm. high, many ascending from the root, simple or proliferously branched, slender. Leaves 2.5-7.5 cm. long, very slender, curved, convolute, rigid, smooth.

Panicle 7-15 cm. long, very narrow, subcylindric; branches very short, crowded or sometimes with a few remote lower down on the stem ascending from a naked base and bearing a dense oblong fascicle of spikelets; rachis smooth, branches scaberulous. Spikelets (excl. awns) 6 mm. long, very short-pedicelled, pale green or straw-coloured. Lower involucre glume 5 mm. long, shortly awned, keel scaberulous; upper 6 mm. long, tip 2-toothed below the awn. Floral glume scaberulous, callus shortly bearded, awn obscurely articulate with the glume, column nearly as long as the glume, slender, smooth, branches capillary, rather short, central one about 12 mm. long.

Locality : Sind : Sehwan to Laki, foot of hills (Sabnis B235 !).

Khandesh : W. Khandesh (Blatter !).

Distribution : Punjab, Sind, Rajputana, Khandesh, S. India, Arabia, tropical Africa.

5. *ARISTIDA POGONOPTILA* Boiss.

Aristida pogonoptila Boiss. Fl. Or. V (1884) 496; Henrard l. c. II (1927) 456.

Arthratherum pogonoptilum Jaub. & Spach Ill. Pl. Or. IV (1850-53) 56, t. 337.

Etymology : *Pogonoptila* is derived from the Greek *pogon* beard and *ptilos* bald, perhaps alluding to the glabrous glumes.

Description : A perennial grass. Rhizome short, oblique, branching. Stems 15-45 cm. high, strict or geniculate, erect, simple or sparsely branching, slender, terete, glabrous, smooth, obsolete and finely striate, few-noded, leafy at the base and covered with imbricate sheaths. Uppermost internode at flowering time scarcely longer than the sheath; lower internodes longer than the upper. Nodes quite glabrous, mostly rufescent. Leaves glaucous-

cent, thin, more or less flexuose or rarely rigid, keelless, on the back finely papillose, articulate on the sheath. Lower leaves 7-25 cm. long, the uppermost very often short (2.5-5 cm.). Lowest sheaths aphyllous, chartaceous, straw-coloured, persistent, subcomplicate, striate, ovate- or oblong-lanceolate, mostly acuminate. Proliferous sheaths rotund-truncate, keelless, nerved, densely ciliate with long, white hairs at the apex, densely bearded at the mouth with a ring of short bristles, otherwise glabrous, the upper ones herbaceous, tubular-involute. No ligule.

Panicle 7.5-15 cm. long, oblong, somewhat lax, simple and made up of many spikelets. Rhachis filiform, continuous, semiterete, scabrous, strict. Branchlets capillary, flexuose, scabrous, alternate, distichous, the spikelets arranged in racemes, pedicelled, mostly 3-5, unequal, getting shorter upwards; pedicels capillary, scabrous, thickened at the apex, most of them longer than the glume. Glumes 3. Involucral glumes awnless, of unequal length, sub-navicular, 3-nerved, glabrous or with scattered hairs on the back and the margins. Lower one shorter, usually fimbriolate at the apex; upper one inserted slightly higher up, narrower than the lower one and about 2 mm. longer, slightly narrowed at the base, emarginate at the apex. Floral glume (including the stalk and awn) about 5 cm. long. Stalk stout, turbinate, densely setulose, bearded-hirsute at the apex. Inner palea tubular-involute, thinly 3-nerved, chartaceous, keelless, oblong, glabrous, cinereous or black-violet, long awned, on the back papillose-scabrous, especially from the middle to the apex, obtusely emarginate after the awn has fallen. Awn deciduous, setaceous-subulate, far below the middle geniculate and trifurcate; the undivided part almost as long as the glume, contorted, erect, canaliculate, filiform, papillose-scabrous, near the apex conspicuously bearded-hirsute, otherwise naked, or laxly hairy; lateral awns capillary, naked, scabrous, more or less diverging, strict, about $\frac{1}{2}$ the length of the central one and much thinner, central awn strict, long-plumose, at the base setaceous-filiform, upwards capillary. Inner palea minute, membranous, hyaline, nerveless, involute, keelless, glabrous, cuneate-obovate, truncate or rotundate at the apex, obsoletely crenulate. Lodicules 2, submembranous, glabrous, finely striate, obliquely ovate, obtuse. Stamens 3. Filaments capillary. Anthers yellowish, glabrous, linear, elongate, emarginate at apex and base. Ovary obovate, quite glabrous. Styles 2, terminal, elongate, filiform, densely plumose, laterally exerted.

Hook. f. in F. B. I. VII, 228 included this species under *A. hirtigluma* Steud., but according to Henrard, it "differs in the glabrous glumes, in the shorter column, more hairy and barbate at the point of insertion of the 3 awns and in the more loosely and longer plumose central awn, without a naked tip."

Locality : Sind (ex Boiss.).

Distribution : Punjab, Sind, Baluchistan.

6. *ARISTIDA HIRTIGLUMA* Steud.

PLATE 141.

Aristida hirtigluma Steud. Nom. ed. 2, pt. 1 (1840) 131, et Syn. Pl. Glum. (1855) 144; Trin. & Rupr. in Mem. Acad. Petersb. (1842) 171; Aitchis. Cat. Punjab Pl. (1869) 164; Duthie Grasses N. W. Ind. (1883) 26, Fodder Grasses N. Ind. (1888) 47; Boiss. Fl. Or. V (1884) 496; Hook. f. Fl. Brit. Ind. VII (1896) 227, excl. *aliquibus* syn.; Cooke Fl. Bomb. II (1908) 1009.

A. ciliata Steud. Hochst. herb. arab. un. it. no. 165 (non Desf.) ex Henrard.

A. ciliata Steud. & Hochst. ex Steud. Nom. ed. 2, pt. 1 (1840) 131 (non Desf.).

A. Schimperii Hochst. & Steud. ex Steud. l. c. 143.

Arthratherum ciliatum Nees Fl. Afr. Austr. I Gramineæ (1841) 182 (excl. syn.).

The following synonyms cited by Hook. f. in Fl. Brit. Ind. VII, 228 have to be excluded.

Aristida decorata Steud. Syn. Pl. Glum. (1855) 421 which is *A. Raddiana* Sav. — *Aristida paradisæa* Edgew. in Journ. As. Soc. Beng. XVI, II (1847) 1219, which is a distinct species. See Blatter Fl. Aden in Rec. Bot. Survey Ind. VII, 3 (1916) 380. — *Aristida pogonophila* Boiss. Fl. Or. V (1884) 496, a distinct species.

Etymology : *Hirtigluma* means having the glumes hairy.

Description : Perennial, stems tufted, 30-60 cm. high, smooth, glabrous, terete, shining; nodes glabrous. Leaves 5-15 cm. long, reaching 1-2 mm. broad when opened out, convolute, filiform with capillary tips; sheaths quite glabrous except for a few long hairs at the mouth, close; ligule a very narrow densely ciliate membrane.

Panicle slender; branches short, erect, capillary. Spikelets pale green or straw-coloured, linear-lanceolate. Lower involucral glume 8 mm. long, linear-oblong, acute, scarious; upper

involucral glume a little longer but similar; floral glume slightly muciculate; callus about 0.5 mm. long, pointed, shortly villous; column of awn 2.5-3 mm. long, plumose with long slender hairs, articulated on the glume, middle branch 3-8 cm. long or more, plumose in the lower half with long delicate hairs, lateral branches very slender, hair-like, about 13 mm. long, not plumose.

Locality : *Sind*: Bholari (Bhude !); Sehwan, sand hills (Bhude !); Laki (Bhude !); hills near Bullo Khan (Woodrow !); Sehwan to Laki, foot of hills (Sabnum B614 !).

Distribution : Tunis, Upper Egypt, Sinai, Syria, Nubia, Abyssinia, Eritrea, Highlands of Somaliland, Arabia, Sind, Punjab.

Explanation of Plate 141 : *Aristida hirtigluma* Steud.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea of floral glume.
5. Stamens, ovary and styles.

7. *ARISTIDA HYSTRICULA* Edgew.

Aristida hystricula Edgew. in Journ. Linn. Soc. VI (1862) 208, *Atchis.* Cat. Panjab Fl. (1869) 164; *Duthie Grasses N. W. Ind.* (1883) 26, *Fodder Grasses N. Ind.* (1888) 47; *Hook. f. Fl. Brit. Ind.* VII (1896) 227; *Cooke Fl. Bomb. II* (1908) 1009.

Etymology : *Hystricula* means a small porcupine.

Description : Annual, dwarf, slender, about 2.5-7.5 cm. high, pale; stems many from the root, 1.3-2.5 cm. high, densely crowded; nodes glabrous. Leaves subulate, curved, convolute, acuminate, glabrous, less than 2.5 cm. long, sheaths glabrous; ligule a small line of hairs.

Panicle without the awns 1.3-2.5 cm. long, shorter than the awns, narrow, few-flowered; branches few, short, erect. Spikelets 10 mm. long or more. Lower involucral glume 4-5 mm. long, much shorter than the upper, ovate-lanceolate, acute, apiculate, scarious; upper involucral glume 10 mm. long, linear, running out into a slender awn or often cleft at the tip into 2 subulate lobes 1-6 mm. long, lower floral glume 4 mm. long; column of awn 13 mm. long, twisted, the 3 branches subequal, extremely slender, 13-20 mm. long.

Henrard l. c. II (1927) 251, points out that "the most striking character, a character neglected by all the authors who studied the species, is the densely hairy bifid callus." Hooker l. c., therefore when saying that the callus is "minute, glabrous" is not correct. Cooke does not describe the callus—Apparently no Indian species has a naked callus.

Locality : *Sind*: Laki (Bhude !); Bholari (Bhude !); Hyderabad (Bhude !); Jamadar ka Landa, near Karachi (Stocks 1187).

Distribution : Punjab, Sind, Baluchistan.

8. *ARISTIDA FUNICULATA* Trin. & Rupr.

PLATE 142.

Aristida funiculata Trin. & Rupr. in Mem. Acad. Petersb. ser. 6, VII (1849) 159; *Atchis.* Cat.

Panjab Fl. (1869) 164; Boiss. Fl. Or V (1884) 492 (*partim*); *Duthie Fodder Grasses N. Ind.* (1883) 47; *Hook. f. Fl. Brit. Ind.* VII (1896) 226; *Cooke Fl. Bomb. II* (1908) 1010.

A. macrathera Rich. Tent. Fl. Abyss. II (1851) 393; Boiss. l. c. 493 (*Macranthera*).

A. Mallica Edgew. in Journ. Proc. Linn. Soc. VI (1862) 206.

A. funiculata Trin. & Rupr. var. *mallica* Henrard l. c. II (1927) 328.

A. paradoxa Steud. ap. Schmidt Fl. Cap. Verd. (1852) 140.

A. funiculata Trin. & Rupr. var. *paradoxa* Henrard l. c. II (1927) 425.

Vernacular names : Pandhri or Pandri kussal, Bushi kussal.

Etymology : *Funiculata* is derived from *fumus*, a rope, cord, referring to the twisted columns of the awn.

Description : Annual, very slender; stems 25-60 cm. long, many, geminately ascending. Leaves 5-15 cm. by 1-2-3 mm., convolute or flat, ciliate, at the base; sheaths glabrous; ligule a small ciliate membrane.

Panicle 10-25 cm. long, lax, narrow; rachis angular; branches short, erect, capillary. Spikelets variable in length, 1.3-2.2 cm. long. Lower involucral glume reaching 2.2 cm. long.



ARISTIDA HIRTIGLUMA STEUD

Delin E. K. Hyde



ARISTIDA FUNICULATA TRIN & RUPE

Delin: R. K. B

linear-lanceolate, acute, 1-nerved, tapering into a slender awn; upper involucrel glume somewhat shorter than the lower, similar in shape and similarly awned, floral glume small, smooth, awned; awn articulate on the glume, the column 13-20 mm. long, twisted, with 3 capillary branches of which the middle is the longest, reaching 3.2 cm. long.

Locality: *Sind* Mirpurkhas (Sabnis B1038 !); Ghara (Blatter & McCann D622 !); Tatta, tombs (Blatter & McCann D623 !), Ghulamalla (Blatter & McCann D624 !); Jam village (Woodrow 19).

Cutch Bhuj, Bhodir Maka (Blatter 3728 !).

Gujarat Ahmedabad, dry waste land (Sedgwick !).

Khandesh: Red earth upland north of Taloda (Sedgwick !), Bor, Tapta River (Blatter & Hallberg 4416 !); Amalner, Bori River (Blatter & Hallberg 5108 !)

W. Ghats Panchgani (Blatter & Hallberg B1310 !)

Deccan Poona (Lisboa), Dapuri near Poona (Jacquemont 489); Pashan near Poona (Gammie !), Kirkee to Poona, railway line (Garade 816 !), Katraj Ghat (Bhide 1041 !); Satara (Lisboa); Sholapur (Lisboa), Wai (Talbot 4483 !), Nasik (Bourke !); Bara-wadi, Purandhar (McCann 5062 !), Rahuri (Nana A227)

S. M. Country Dry fields, Yelvigi, 1,800 ft., rainfall 28 in. (Sedgwick & Bell 4898 !); Belgaum (Woodrow), near Belgaum (Woodrow !); Badami (Bhide !)

Ecology: Generally subgregarious, but sometimes so common that extensive patches of it have a dull grey or glaucous colour

Distribution: Punjab, Rajputana, W. Peninsula, Baluchistan, Arabia, tropical Africa.

Economic uses: Useless as fodder

Explanation of Plate 142: *Aristida funiculata* Trin. & Rupr.

1. Spikelet
2. Lower invol. glume
3. Upper invol. glume.
4. Lodicules.
5. Stamens and grain.
6. Floral glume

9 ARISTIDA REDACTA Stapf.

Aristida redacta Stapf in Kew Bull. (1892) 85, Hook. f. Fl. Brit. Ind. VII (1896) 227; Cooke Fl. Bomb. II (1908) 1010

Stipa aristoides Stapf ex Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 358; Prain Beng. Pl. 1211

Etymology: *Redacta* is derived from *reducere*, meaning reduced, alluding to the branches of the awn which are absent or very short

Description: Annual or sometimes perennial (and then more robust), stems tufted, 15-60 cm. high, simple, or proliferously branched in robust specimens, nodes glabrous. Leaves 10-15 cm. long, very slender, convolute, hairy above, smooth below, margins rough; sheaths glabrous; ligule narrow, shortly and densely ciliate

Panicle 23-25.5 cm. long by 1.9 cm. broad, branches usually twin, remote, at length spreading; pedicels unequal, shorter than the glumes. Spikelets on long or short capillary pedicels, green or purplish. Lower involucrel glumes subequal, narrowly lanceolate, finely acuminate, shortly aristate, reaching 13 mm. long; floral glume with a hairy callus, usually purplish, armed with an awn 3.2 cm. long, column of awn capillary, twisted, easily separating from the glume but not truly articulate; branches 3 from the top of the column, the lateral much shorter than the middle one, sometimes 0

Locality: *Konkan:* Trombay, common on the hillside (McCann A212 ! A213 !); Kan-keshwar Hill, Alibag (Bhide !).

W. Ghats: Lonavla (Woodrow); Panchgani (Blatter & Hallberg B1275 !)

Deccan: Junnar, Poona Dist. (Woodrow), Wai (Talbot 4484 !), Lohagad, plain (McCann 9503 !); Barawadi, below Purandhar (McCann 5063 !); Pashan (Gammie !).

S. M. Country. Hubli, barren hillside, 2,200 ft., rainfall 28 in. (Sedgwick & Bell 4929 !), Yelvigi, dry fields, 2,000 ft., rainfall 28 in. (Sedgwick & Bell 4897 !); Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4891 !, Talbot 2910) Haveri (Talbot 2216 !).

N. Kanara (Law).

Ecology: This species commonly grows on open hillside among other plants by which it is supported as it is very weak and bends over. A subgregarious species occasionally forming almost pure associations.

Distribution: Central India, Nagpur, W. Bengal, W. Peninsula, S. Persia.

TRIBE IX: Zoysieae.

Mature spikelets falling entire and singly, or in clusters. Floret 1. Rhachilla not continued beyond the floret. Involucral glumes equal, or the lower much smaller or suppressed. Floral glume small, delicately membranous, 3-1-nerved. Spikelets in slender spiciform panicles or racemes.

See key page xviii.

75. *TRACHYS* Pers.

A diffuse softly villous annual grass. Leaves ovate-lanceolate.

Inflorescence of 2-3 spikes radiating from the top of a long peduncle; rhachis broad, herbaceous, jointed, each joint bearing on the under surface at the articulation a solitary globose cluster of 2-3 perfect 1-flowered glabrous spikelets surrounded by many short spinose-cent glumes of imperfect ones. Glumes 4, very unequal; lower involucral glume minute, tooth-like; upper involucral glume elongate, linear-lanceolate, very acute, membranous, strongly nerved; lower floral glume much the largest, obliquely ovate or obovate-oblong, cuspidately acuminate, rigidly coriaceous, 9-many-nerved, paleate, empty, the palea minute; upper floral glume much shorter and narrower than the lower one, linear-oblong, acuminate, chartaceous, smooth, dorsally convex, with incurved margins, 2-sexual; palea as long as the glume, acuminate, hyaline, the margins inflexed below the middle. Lodicules very minute or 0. Stamens 3; anthers linear. Styles very long; stigmas slender, penicillate, exerted at the top of the glume. Grain oblong, compressed, free within the glume and palea.

Species 1—Coast of India and Ceylon.

1. *TRACHYS MURICATA* (Linn.) Steud.

PLATE 143.

Trachys muricata (Linn.) Steud. Syn. Pl. Glum. (1855) 112.

Cenchrus muricatus Linn. Mant. (1767) 302.

Trachys mucronata Pers. Syn. I (1805) 85; Beauv. Agrost. (1812) 107, t. 21, fig. 7; Hook. f.

Fl. Brt. Ind. VII (1896) 96; Cooke Fl. Bomb. II (1908) 1014.

Cenchrus tripsaceus Herb. Linn. ex Munro in Journ. Linn. Soc. VI (1862) 55.

Trachystachys geminata A. Dietr. Sp. Pl. II, 16.

Tripsachum distachyum Herb. Linn. ex Munro l. c.

Panicum dimidiatum Burm. Fl. Ind. (1768) 25, t. 8, fig. 3.

P. squarrosum Retz. Obs. IV, (1786) 15, t. 1; Roxb. Cor. Pl. III, t. 206; Fl. Ind. I (1832) 288.

Etymology: *Trachys* means rough, alluding to the rough spike—*Muricata* means rough.

Description: Stems 15-45 cm. long, ascending or prostrate, leafy, glabrous; nodes villous. Leaves 2.5-10 cm. by 6-13 mm., ovate-lanceolate, acuminate, flaccid, softly villous on both surfaces, margins often crisped, base rounded; sheaths glabrous or hairy; ligule a thin membrane.

Peduncles reaching 20 cm. long, slender, shining. Spikes 2.5-5 cm. by 2.5-4 mm., stipitate, the stipes 2.5-5 mm. long, glabrous and more or less angular; rhachis rigidly herbaceous, with a broad flat midrib and broad closely nerved wings. Clusters of spikelets reaching 6 mm. diam., often partially sunk in a concavity of the rhachis; perfect spikelets reaching 6 mm. long, the imperfect much shorter. Glumes 4; lower involucral glume 1.6-2 mm. long, lanceolate, acute; upper involucral glume 4 by 1.6 mm., linear-lanceolate, very acute, 3-nerved, hyaline; lower floral glume 5 by 3.2 mm., broadly and obliquely ovate or obovate, cuspidately acuminate, with many green nerves, paleate, the palea 1.2 mm. long, oblong, obtuse, hyaline; upper floral glume 3.2 by 1.6 mm., ovate, acute.

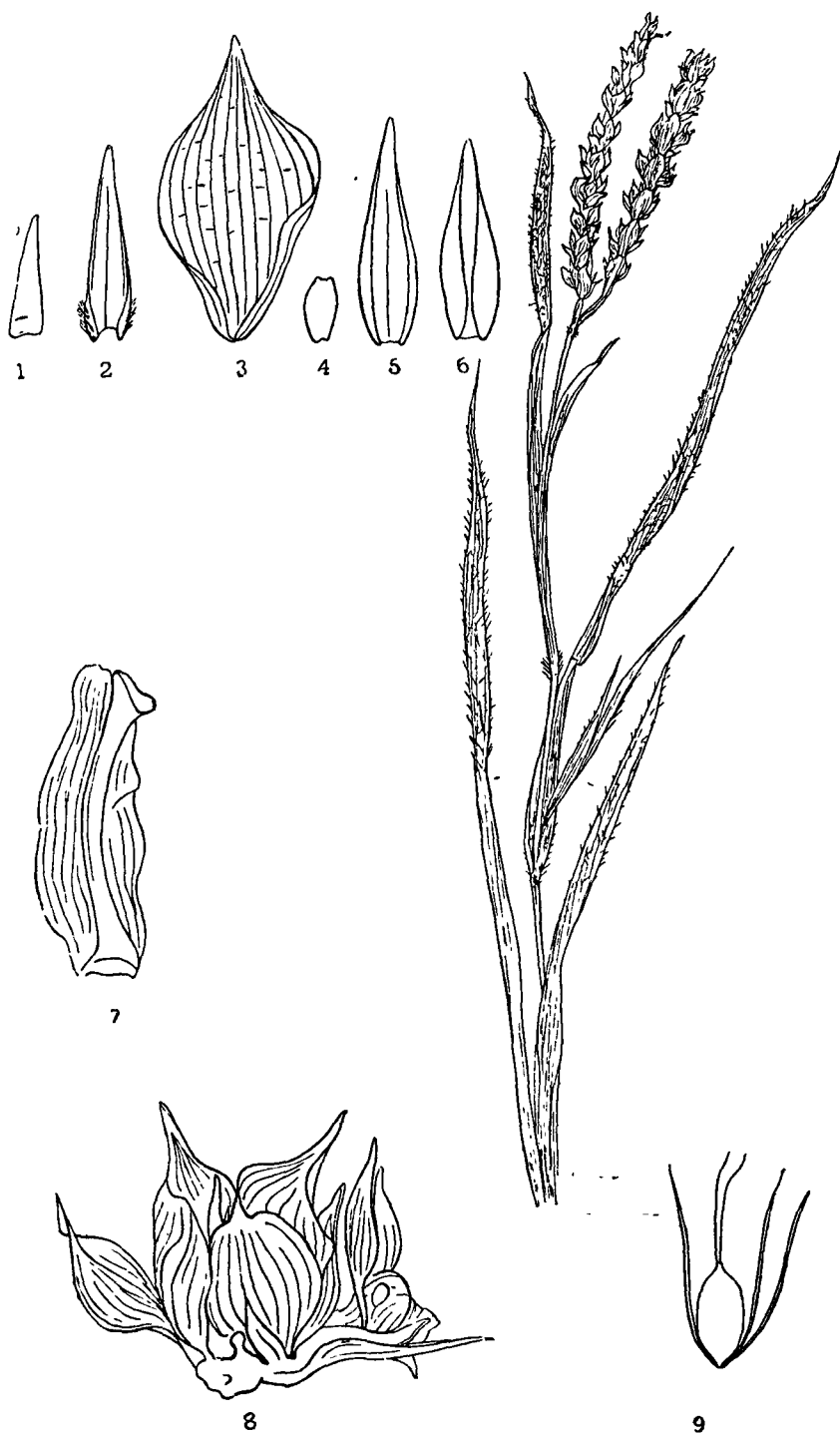
Locality: *S. M. Country:* Badami (Blude I, Cooke, Woodrow); Gokak (Talbot I); Dharwar (Woodrow).

Ecology: Grows in sandy ground near the sea.

Distribution: W. Peninsula, Ceylon.

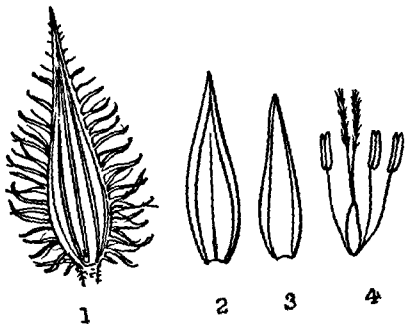
Explanation of Plate 143: *Trachys muricata* (Linn.) Steud.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Upper floral glume.



TRACHYS MURICATA (LINN.) STEUD

Desin: B. K. Bhida.



NAZIA RACEMOSA KUNTZE.

6. Palea of upper floral glume.
7. Part of rhachis.
8. Cluster of spikelets.
9. Grain.

76. *NAZIA* Adans.

(*Tragus* Hall)

Annual or perennial grasses, stems erect, ascending or decumbent. Leaves linear, rather rigid, with cartilaginous spinulously ciliate margins, ligule a delicate ciliate rim.

Spikelets in deciduous clusters of 2-4, on the filiform continuous axes of cylindric spike-like racemes or panicles. Lower involucreal glume minute, hyaline or suppressed; upper involucreal glume 5-ribbed or 5-nerved, membranous between the hispid or spinous-hooked ribs or nerves, exceeding the floral glume, floral glume solitary, lanceolate or oblong-lanceolate, membranous, 3-nerved, 2-sexual, palea as long as the glume, 2-nerved. Lodicules 2, broad, cuneate, fleshy. Stamens 3. Styles distinct, very slender, stigmas narrow, plumose, exerted from the top of the glume. Grain oblong to ellipsoid, free within the glume and palea.

The type species is *Cenchrus racemosus* Linn. and the genus *Nazia* Adans. is based on this species. As to *Tragus* Haller, this author, according to Hitchcock, cites pre-Linnaean writers who connect *Tragus* with *Cenchrus racemosus* Linn. (Hitchc. Genera of Grasses Unit. St. in Unit. St. Dept. Agric. Bull. 772 (1920) 165).

Species 3.—Tropical regions of both hemispheres

1. *NAZIA RACEMOSA* Kuntze.

PLATE 144.

Nazia racemosa Kuntze Rev. Gen. Pl. III, 357; Hitchcock Genera of Grasses Unit. St. in Unit. St. Dept. Agric. Bull. 772 (1920) 165

Tragus racemosus Scop. Introd. Hist. Nat. (1777) 73, Desf. Fl. Atlant. II, 386; Duthie Grasses N. W. Ind. (1883) 13, Indig. Fodder Grasses (1886) t. 14, Fodder Grasses N. Ind. (1888) 22; Hook. f. Fl. Brit. Ind. VII (1896) 97; Cooke Fl. Bomb. II (1908) 1014; Haines Bot. Bih. and Or. (1924) 979.

T. brevicaulis Boiss. Diag. Pl. Or. ser. I, XIII, 44

Lappago racemosa Honck. Syn. Pl. Germ. I (1792-3) 440, Host Gram. Austr. I, t. 36; Sibth. Fl. Graec. II, t. 101; Reichb. Ic. Fl. Germ. I, t. 30; Aitchis. Cat. Panjab Pl. (1869) 163.

L. biflora Roxb. Fl. Ind. I (1832) 281, Grah. Cat. (1839) 234

L. athena Dalz. & Gibs. Bomb. Fl. (1861) 295 (non Spreng.).

L. occidentalis Nees in Schump. Pl. Arab. Fel. ed. II, no. 793.

Cenchrus racemosus Linn. Sp. Pl. (1753) 1049

C. linearis Lam. Fl. Franc. III, 631

Phalaris muricata Forsk. Fl. Aeg.-Arab. (1775) 302.

Vernacular name : Barchente

Description : Stems tufted, leafy below, simple or branched, the branches often fasciculate and densely leafy, geniculate, ascending from a decumbent base or wholly decumbent, up to 30 cm. long; nodes glabrous. Leaves variable in length, 0.6-3.8 cm. by 2.5-4 mm., linear-lanceolate, acuminate, flat or undulate, rigid, very glaucous, subpungent, smooth, with pectinately ciliate margins, closely striate, lowest sheaths short, broad, pale, the intermediate ones more or less herbaceous, the uppermost tumid, usually embracing the base of the panicle; ligule a slender ciliate rim.

Inflorescence a cylindric spike-like panicle 2-7.5 cm. long, rhachis slender, straight or slightly undulate, pubescent. Spikelets 3-2 mm. long, acute, usually 2 facing each other and appearing like a single spikelet with 2 equal echinate glumes; pedicels stout, about 0.8 mm. long. Glumes 3 or 2; lower involucreal glume very minute, about 0.5 mm. long, hyaline, often suppressed; upper involucreal glume 3-5 mm. long, slightly curved, involute, enveloping the floral glume, strongly 5-ribbed, with rows of stout hooked spines along the ribs, thin between the ribs; floral glume solitary, 2 mm. long, oblong-lanceolate, shortly apiculate.

Locality : Sind : Tatta, Tombs (Blatter & McCann D679 I).

Kathnagar : Rajkot (Woodrow).

Gujarat : Ahmedabad, waste ground (Sedgwick I); Dumas, near Surat (Graham).

Khandesh : Bor, Tapti bank (Blatter & Hallberg 5467 I).

Konkan : Salsette (Graham).

Deccan : Poona (Woodrow !, Jacquemont 386) ; Poona, Chatterahinji Hill (Bhude !); Bijapur (Cooke, Woodrow).

S. M. Country : Dharwar (Sedgwick & Bell 4145 !); Mallapur Hill, Bagalkot (Paranjpye !); Gokak (Shevade !); Badami (Woodrow !).

Ecology : A sporadic xerophytic species. Very common on barren uplands of Dharwar Dist. Likes dry pasture ground.

Distribution : Most warm countries.

Economic uses : Said to be nutritious and much grazed in the rains.

Explanation of Plate 144 : *Naza racemosa* Kuntze.

1. Upper invol glume.
2. Floral glume.
3. Palea of floral glume.
4. Stamens, ovary and styles.
5. Spikelets

77 LATIPES Kunth.

A perennial rather rigid grass. Leaves subulate, convolute

Spikelets 1-flowered, in simple spike-like racemes, 2-seriate (1 usually imperfect), persistent on the flattened truncate spreading articulate pedicels; rhachis flexuous Glumes 3; involucrel glumes thickly coriaceous, lower involucrel glume usually the longest, narrow, recurved, 3-nerved, with pectinate margins, dorsally smooth; upper involucrel glume lanceolate, spinulously tuberculate, embracing the floral glume, floral glume solitary, shorter than the upper involucrel glume, oblong, acute, hyaline; palea minute, linear-oblong. Lodicules 2, hyaline. Stamens 3, anthers oblong. Styles free. Grain free, obliquely ovoid-lanceolate.

Species 1.—From Senegal to Sind.

1. LATIPES SENEGALENSIS Kunth.

PLATE 145

Latipes senegalensis Kunth Rev. Gram. I (1829) 261, t. 42, Enum. Pl. I (1838) 171, Suppl. 125, Duthie Grasses N. W. Ind. (1883) 13, Fodder Grasses N. Ind. (1888) 22; Hook. f. Fl. Brt. Ind. VII (1896) 97, Cooke Fl. Bomb. II (1908) 1015.

Lappago Latipes Steud. Syn. Pl. Glum. (1855) 112.

Tragus senegalensis J. Gay ex Kunth Enum. Pl. I (1838) 171.

Etymology : *Latipes* is derived from *latus*, broad, and *pes*, foot or footstalk, alluding to the flattened pedicels

Description : Stems 7-5-30 cm. long, wiry, creeping, with many erect or spreading branches, leafy. Leaves 2-5-7-5 cm. long, subulate, convolute, sheaths glabrous, the mouth hairy; ligule 0.

Racemes 5-15 cm. long; rhachis glabrous, pedicels distant, 2-5 mm. long, cuneate, flattened, with winged and ciliate margins, bearing at the broad apex 2 purplish brown spikelets one perfect, the other not. Glumes 3, lower involucrel glume rather more than 3-2 mm. long, lanceolate, narrow, recurved, 3-nerved, with pectinate margins, purplish brown, upper involucrel glume rather more than 2-5 mm. long, ovate-lanceolate, purplish brown, tuberculate on the back; floral glume solitary, 1-6 mm. long, ovate-oblong, acute, hyaline

Locality : *Sind* (Woodrow !), Karachi (Burns !); 20 miles north of Karachi (Woodrow), Jemadar ka Landa, near Karachi (Stokes 1186)

Distribution : Baluchistan, Arabia, Abyssinia, Senegal.

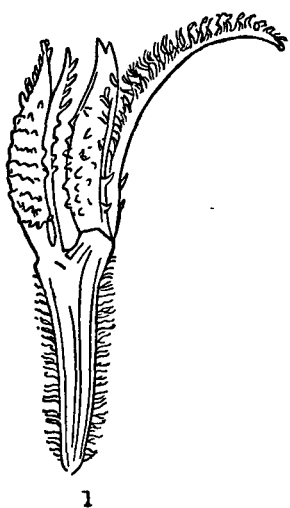
Explanation of Plate 145 : *Latipes senegalensis* Kunth.

1. Spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume
5. Palea of floral glume.
6. Stamens and grain.

78. OSTERDAMIA Neck.

(*Zoysa* Willd.).

A small rigid glabrous grass, with a long wiry rootstock giving off short erect leafy branches terminating in solitary pedunculate spike-like racemes. Leaves distichous subulate, concave, pungent.



1



2



3



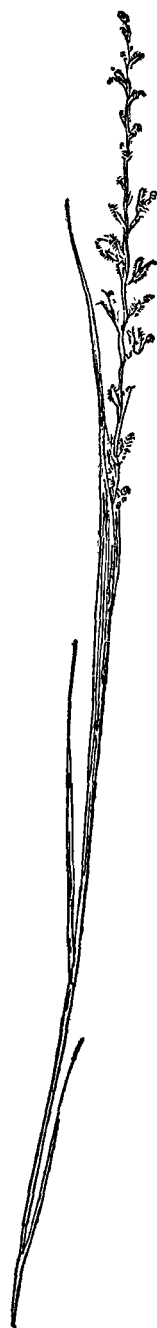
4



5



6



LATIPES SENEGALENSIS KUNTH

Delin R K Bhude



OSTERDAMIA MATRELLA O. KUNTZE.

Spikelets ovoid, laterally compressed, 1-flowered, articulate on short or rather long stout angular pedicels appressed to a rigid rhachis. Glumes 2; involucrel glume empty, rigidly coriaceous, the margins closely appressed as if connate, with a membranous tip, nerveless; floral glume much smaller than and completely enclosed in the involucrel glume, ovate-lanceolate, hyaline, 1-nerved; palea linear-oblong, hyaline. Lodicules 0. Stamens 3, anthers long. Styles very long, connate below; stigmas plumose, exerted at the top of the spikelet. Grain oblong, free within the glume and palea.

Species about 10.—Tropical Asia to Australia and New Zealand, Mauritius; in Japan alone there are 7 species (See . Honda Masaji, *Revisio Gram. Japoniae I.*, in Bot. Mag. Tokyo 37 (1923) 113-124).

1. *OSTERDAMIA MATRELLA* O. Kuntze.

PLATE 146.

Osterdamia Matrella O. Kuntze. Rev. Gen. Pl. II (1891) 781; Hitchcock Genera of Grasses Unit. St. in Unit. St. Dept. Agric. Bull. 772 (1920) 166.

Agrostis matrella Linn. Mant. II, 185; Roxb. Fl. Ind. I (1832) 317.

Matrella juncea Pers. Syn. Pl. I (1805) 73.

Zoysia pungens Willd. in Ges. Naturf. Fr. Neue Schrift. III (1801) 441; Br. Prodr. X, 208; Beauv. Agrost. I, t. 4, fig. 1, Miq. Fl. Ind. Bat. III, 478, Hook. f. Fl. Brit. Ind. VII (1896) 99; Cooke Fl. Bomb. II (1908) 1016; Haines Bot. Bih. and Or. (1924) 979.

Z. aristata, *Brownii*, *Griffithiana* et *sedoides* C. Muell. in Bot. Zeit. XIII (1855) 272, 273, 274.

Z. sinica Hance in Journ. Bot. VII (1869) 168.

Z. setacea Nees ex Steud. Nom. ed. 2 (1840) 801.

Z. tenuifolia Trin. in Mem. Acad. Petersb. ser. VI, IV, Sc. Nat. II (1836) 96.

Panicum Crinum-ursi Bory ex Steud. Nom. I. c. 255.

Vernacular name : Manila Grass.

Description : Rootstock rigid, wiry, up to 60-90 cm. long, the branches interlaced and rooting, sending up short leafy stems 15-25 cm. high. Leaves 2.5-7.5 cm. long, coriaceous, dorsally rounded, subulate, concave, pungent; sheaths short, ligule a narrow ciliate membrane.

Racemes 2.5-3.8 cm. long, strict, erect. Spikelets 3-2 mm. long, erect, pedicels usually short, angular. Involucrel glume biconvex, much compressed at the membranous tip, smooth and shining, thickly coriaceous; floral glume shorter and much narrower, hyaline, palea linear-oblong, nerveless.

Locality : *Gujarat :* Daman, on sand hills (Herb. Econ. Bot. I, Lisboa).

Konkan : Ahbag, sandy shore (Ezekiel !), Juvem (McCann 4314 !); Bombay, Walkeshwar, seashore, rocks (Sabnis !), Marine Lines (Hallberg 9873 !); Versova, marsh (McCann 9875 !).

N. Kanara : Karwar (Talbot 1531 !, McCann !).

Ecology : A seaside plant, on rocks, sand and in salt marshes.

Distribution : Tropical Asia.

Economic uses : As it creeps to a great length it is a good sand binder.

Explanation of Plate 146 : *Osterdamia Matrella* O. Kuntze.

1. Invol. glume, with pedicel.
2. Floral glume
3. Stamens, ovary and styles.
4. Palea of floral glume.

79. *PEROTIS* Ait.

Small annual or subperennial grasses; stems tufted, leafy. Leaves usually broad, rigid and ciliate; ligules hyaline or 0.

Spikelets very small, linear-lanceolate, sessile or subsessile on the continuous rhachis of a spike or a lax spike-like raceme, articulate on and falling entire from the rhachis or the very short pedicels. Glumes 3; involucrel glumes equal, empty, linear-lanceolate, rigidly membranous, with a strong midrib produced into a long capillary awn; floral glume solitary, lanceolate, acute, hyaline, 1-nerved, 2-sexual, palea narrow, hyaline, nerveless. Lodicules 2, broad,

cuneate. Stamens 3. Styles short; stigmas plumose, laterally exerted. Grain cylindric, slender, exerted from the unchanged floret and enclosed with it in the involucreal glumes.

Species 4.—Tropics of the Old World and subtropical Australia.

1. *PEROTIS INDICA* (Linn.) O. Kuntze.

PLATE 147.

Perotis indica O. Kuntze Rev. Gen. Pl. II (1891) 787.

Anthozanthum indicum Linn Sp. Pl. (1753) 28

Perotis latifolia Ait. Hort. Kew. I (1789) 85; Beauv. Agrost. (1812) t. 4, fig. 9; Roxb. Fl. Ind.

I (1832) 233, Grah Cat. Bomb. Pl. (1839) 237; Dalz. & Gibs. Bomb. Fl. (1861) 296;

Duthie Grasses N. W. Ind. (1883) 13; Miq. Fl. Ind. Bat. III, 479; Hook. f. Fl. Brit. Ind.

VII (1896) 98; Cooke Fl. Bomb. II (1908) 1016; Haines Bot. Bih. and Or. (1924) 978.

P. Burmanni Steud. Nom. ed. I, 605.

P. cubana Wright in Sauv. Fl. Cub. (1873) 202.

P. glabrata Steud. Syn. Pl. Glum. (1855) 186.

P. hordeiformis Nees ex Steud. Nom. ed. II, II (1840) 306.

P. longiflora Nees in Hook. & Arn. Bot. Beech. Voy. 247.

P. patula Nees ex Steud. Nom. I. c.

P. rara R. Br. Prodr. (1810) 172.

P. scabra Willd. ex Trin. Diss. II, 172.

P. spiciformis Beauv. ex Steud. Nom. ed. I, 605.

Perotis laxifolia Beauv. l. c. 6.

Saccharum spicatum Linn. Sp. Pl. (1753) 54.

Agrostis spiciformis Linn. f. Suppl. (1781) 108.

Xystidium barbatum Presl. Reliq. Haenk I (1830) 228.

X. maritimum Trin. Fund. Agrost. (1820) 102, t. 2.

Rheede Hort. Mal. XII, t. 62.

Vernacular name : Kuras.

Etymology : The root of *Perotis* is *peros*, mutilated. The allusion is not clear.

Description : Stems tufted, geniculate, suberect, ascending, 7-5-38 cm. long, glabrous. Leaves 1-3-3-8 cm. by 3-8 mm., ovate or lanceolate, from a broad amplexicaul base, acute or acuminate, flat or somewhat undulate, glaucous, with rigidly ciliate margins; ligule 0.

Racemes slender, 5-20 cm. long, dense, rhachis subterete, glabrous. Spikelets 2 mm. long, narrowly linear, subterete, scaberulous. Involucreal glumes equal and similar, often purple, linear-lanceolate, each with a long scaberulous awn reaching sometimes as much as 16 mm. long, purple or yellow; floral glume solitary, very narrowly linear, rather shorter than the involucreal glumes. Grain 1-6 mm. long, almost cylindric.

Easily recognized by its purplish squirrel-tail-like inflorescence.

Locality : Gujarat : Baroda (Cooke); Surat (Lisbos); Dumas near Surat (Dalzell & Gibson), Daman, on sand hill (Bhide !); Ahmedabad (Saxton 1052 !); Balsar (Herb. St. X. C !).

Konkan : Juvem (McCann 4312 !); Versova (McCann 4304 !); Ahbag, sandy shore (Ezekiel !); Bassein (Bhide !, McCann !); Malwan (Woodrow)

W. Ghats : Londa (Bhuva !)

S. M. Country : Mallapur Hill, Bagalkot (Paranjpye !); Gokak (Shevade !); Badami (Bhide !, Cooke, Woodrow); Gokak Falls (Sedgwick !).

N. Kanara : Kala Nuddi (Sedgwick & Bell 4287 !); Karwar (Talbot 1068 !, McCann !); Honavar (Talbot 1068 !).

Ecology : A common species of sandy tracts, particularly along the shores of the Presidency well above high water mark. Specimens 60-90 cm. high have been seen at the estuary of the Kala Nuddi River, N. Kanara.

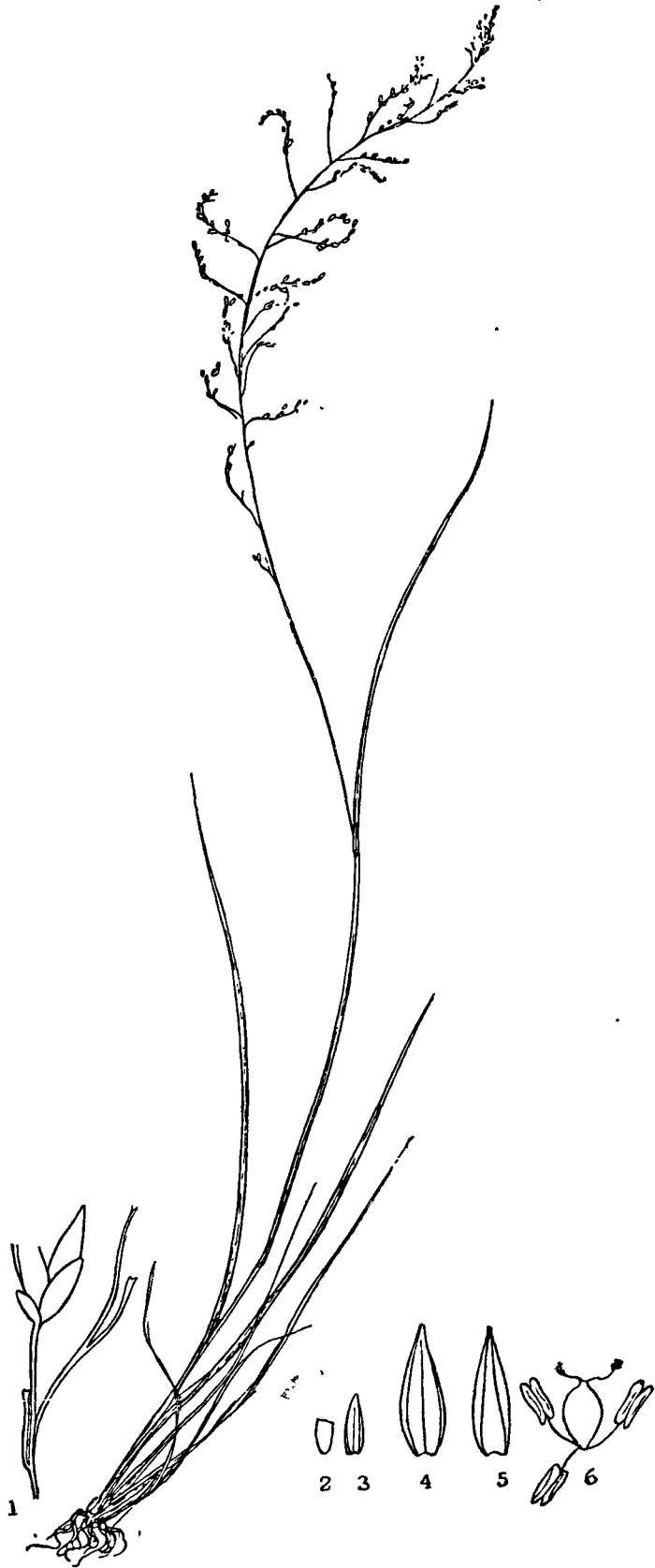
Distribution : More or less throughout India, Ceylon, S. Africa.

Explanation of Plate 147 : *Perotis indica* O. Kuntze.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume with floral glume.
4. Palea.
5. Grain.



PEROTIS INDICA O. KUNTZE



TRIBE X: Sporoboleae.

Involucral and floral glumes very similar. Floret 1. Rhachilla very rarely continued beyond the floret. Floral glume membranous, acute or obtuse, not changed when ripe, 1- or more or less distinctly 3-nerved, awnless, usually olive-green or olive-grey, side-nerves, if present, delicate, evanescent above. Seed often free in the delicate pericarp.

See key page xix.

80. SPOROBOLUS R. Br.

Perennial (rarely annual) glabrous grasses, erect or prostrate, or creeping. Leaves narrow, flat or convolute.

Spikelets 1-flowered, small or minute, in effuse or contracted panicles, articulate on their pedicels; rhachilla not produced beyond the palea. Glumes 3, usually membranous, 1-nerved or nerveless; involucral glumes empty, unequal, separately caducous; floral glume not articulate at the base, ovate or oblong, obtuse or acute; callus very short, glabrous, palea as long as the glume and of similar texture, broadly oblong, often dorsally narrowly inflexed along the median line, with a nerve-like ventral ridge along which the palea splits between the two very close often very obscure nerves. Lodicules very minute or 0. Stamens 2-3; anthers short or long. Styles 2, free, stigmas very short. Grain oblong, obovoid or pyriform, free within the glume and palea, with a loose hyaline pericarp.

Species about 100.—Warm regions of both hemispheres, most abundant in America.

Cooke describes 10 species. We retain all of them changing *S. arabicus* into *S. pallidus* and add 3 others: *S. virginicus* Kunth, *S. scabrifolius* Bhide, and *S. tremulus* Kunth.

A. Involucral glumes both shorter than the floral glume.

I. Stamens 2.

1. Culms 30-90 cm high; panicle reaching 25 cm. 1. *S. diander*.
2. Culms scarcely 15 cm. high, panicle reaching 20-25 cm. 2. *S. indicus*.

II. Stamens 3.

1. Panicle narrow, 12-20 mm. broad. Spikelets reaching 2.5 mm. long 3. *S. indicus*.
2. Panicle reaching 7.5 cm. broad.
 - a. Panicle 30-45 cm. long. Spikelets 1 mm. long 4. *S. minutiflorus*.
 - b. Panicle 10-15 cm. long. Spikelets 2 mm. long 5. *S. volados*.

B. Lower involucral glume as long as the floral glume or nearly so.

Panicle interrupted.

- I. Spikelets 2.5-2 mm. long. Leaves very pale 6. *S. virginicus*.
- II. Spikelets 1.5 mm. long. Leaves glaucous 7. *S. glaucifolius*.

C. Lower involucral glume much shorter than either of the two others.

I. Panicle contracted.

1. Perennials.
 - a. Margins of leaves smooth 8. *S. tremulus*.
 - b. Margins of leaves serrulate 9. *S. orientalis*.
2. Annual 10. *S. piliferus*.

II. Panicle effuse.

1. Spikelets 2.5 mm. long 11. *S. pallidus*.
2. Spikelets 1-1.5 mm. long.
 - a. Floral glume ovate, acute 12. *S. scabrifolius*.
 - b. Floral glume ovate-lanceolate, acuminate 13. *S. coromandelianus*.

1. SPOROBOLUS DIANDER Beauv.

PLATE 148.

Sporobolus diander Beauv. Agrost. (1812) 26; Jacq. Ecol. Gram. t. 28; Link Enum. Hort. Reg. Berol. I (1827) 87; Kunth Enum. Pl. I (1838) 213; Griff. Notul. III, 46, Ic. Pl. Asiat. t. 139, fig. 85; Dalz & Gibs. Bomb. Fl (1861) 296; Aitchis. Cat Panjab Pl. (1869) 165; Duthie Grasses N. W. Ind. (1883) 29, Fodder Grasses N. Ind. (1888) 40, t. 63; Miq. Fl. Ind. Bat. III, 375; Hook. f. Fl. Brit. Ind. VII (1896) 247; Cooke Fl. Bomb. II (1908) 1017.

Agrostis diandra Retz. Obs. V (1789) 19; Roxb. Fl. Ind. I (1832) 317.

Vilfa erosa Trin. in Mem. Acad. Petersb. ser. VI, Sc. Nat. II (1840) 86.

V. Retz Steud. Nom. ed. II, II (1840) 768, Syn. Pl. Glum. (1855) 162.

Vernacular name : Chireya-ka-dana.

Etymology : *Sporobolus* is derived from the Greek *spora*, a seed, and *bolus*, a throw or cast. — *Drander* means having 2 stamens.

Description : Annual or perennial, stems tufted, 30-90 cm high, slender, smooth; nodes glabrous. Leaves 10-25 cm by 1-1.6 mm., with filiform tips, flat or convolute, smooth, strongly nerved, sheaths smooth, ribbed, the lower short, the upper very long, ligule a very narrow ridge of minute hairs.

Panicle reaching 25 by 5 cm, erect, narrowly pyramidal; rachis slender, quite smooth; branches capillary, erect or spreading, naked at the base 0.6-5 cm. long, with numerous very minute spikelets racemously arranged along the branchlets. Spikelets 1.2-1.4 mm. long; pedicels very short. Glumes 3; lower involucre glume very short, scarcely 0.5 mm. long, broadly oblong, nerveless, hyaline, with erose tip, upper involucre glume about 0.8 mm. long, broadly elliptic-oblong, hyaline, obscurely 1-nerved, floral glume 1.2-1.4 mm. long, broadly ovate-oblong, subacute, 1-nerved; palea plicate in the median line. Stamens 2. Grain obovoid, truncate, obtusely quadrangular, umbonate by the loose pericarp, red-brown, rugulose.

Locality : Sind. Jamesabad, fields (Sabnis B927 !).

Gujarat : Ahmedabad (Sedgwick !).

Konkan. Bombay (Blatter 5267 !).

W. Ghats : Khandala (McCann 5409 !), Panchgani (Blatter & Hallberg B1318 !); Londa (Bhude !).

Deccan : Deolali (Blatter 4549 !), Chattarshingji Hill, Poona (Ezekiel I, Jacquemont 352); Katraj Ghat (Shevade !).

S. M. Country : Dharwar (Sedgwick 2658 !).

N. Kanara : Dandeli, 1,800 ft, rainfall 100 in. (Sedgwick & Bell 4221 !).

Ecology : A sporadic species. Common in the Dharwar Dist. Likes moist pasture ground.

Distribution : India, Ceylon, Asia, tropical Australia.

Economic uses : It is described as a favourite fodder grass for cattle and horses.

Explanation of Plate 148 : *Sporobolus diandra* Beauv.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
6. Stamens, grain and styles.

2. SPOROBOLUS SINDICUS Stapf.

Sporobolus indicus Stapf in Cooke Fl. Bomb. II (1908) 1018.

Description : A low perennial 10-12.5 cm high; roots stout, wiry; stems densely tufted, the barren ones subwoody, 2 mm diam., clothed below with numerous withered leaf-sheaths, the flowering stems lateral from the barren ones, slender. Leaves pungent, those of the barren stems crowded, short, ovate-lanceolate to narrowly lanceolate, 6-13 mm long, with spinous margins, those of the flowering stems narrowly linear, acuminate, distant, often with distantly spinous margins; sheaths closely appressed to the stem, ribbed; ligule a very narrow ciliate membrane.

Panicle 2-2.5 cm long, contracted, often spike-like, branches erect or ascending, filiform, densely clothed with spikelets. Spikelets 1.6-2 mm. long, ovoid, acute, pedicels short. Glumes 3, hyaline; lower involucre glume 1 mm. long, ovate, acute, nerveless, upper involucre glume 1.2 mm long, oblong, obtuse, nerveless, floral glume 1.6 mm. long, ovate, obtuse (acute when folded), 1-nerved; palea shorter than the glume, oblong, truncate. Stamens 2. Grain 0.8 mm. long, broadly obovoid, compressed, reddish brown.

Locality : Sind : 20 miles from Karachi (Woodrow).—We have not seen this species.

Distribution : So far endemic.

3. SPOROBOLUS INDICUS B. Br.

Sporobolus indicus B. Br. Prodr. (1810) 170; Link Hort. Reg. Berol. I (1827) 87; Kunth Enum Pl I (1838) 211; Duthie Fodder Grasses N. Ind. (1888) 49; Hook. f. Fl. Brit.

Ind. VII (1896) 248; Trin. Fl. Ceyl. V, 261, Fran Beng. Pl 1213; Cooke Fl Bomb. II (1908) 1018; Haines Bot. Bih and Or (1924) 974.

Agrostis indica Linn. Sp. Pl. (1753) 63

A. elongata Lamk. Ill I, 142

A. tenacissima Jacq. Collect. I, 85, Ic. Rar. 3, t. 16 (excl. syn.).

Sporobolus tenacissimus Beauv Agrost. (1812) 26, Duthie Fodder Grasses N. Ind. (1888) 49.

Vilfa capensis & elongata Beauv Agrost. (1812) 16, Trin. Gram. Diss. I, 154, Steud. Syn. Pl. Glum. (1855) 159

V. exilis Trin. in Mem. Acad. Petersb. ser. 6, So. Nat. II (1840) 89.

V. indica Trin ex Steud. Nom. ed II, II (1840) 767, Syn. Pl Glum. (1855) 162.

V. tenacissima H. B. & K Nov. Gen. et Sp. I (1816) 138; Trin. Sp. Gram. Ic. t. 60.

Hitchcock has separated *S. berterianus* and *S. elongatus* from *S. indicus*.

Vernacular name : Ghoria.

Description : Perennial, stems 60-90 cm. high, densely tufted, stout, internodes long; nodes glabrous. Leaves mostly crowded near the base, 30-60 cm. long, very slender, wiry, flexuous, convolute (rarely flat), with long filiform tips, quite smooth; sheaths smooth, ribbed; ligule a ridge of minute hairs

Panicles 30-45 cm. long by 13-20 mm. broad, often interrupted; rachis slender, smooth; branches very short, densely crowded, erect, covered to the base with imbricate green spikelets. Spikelets 2-2.5 mm long, pedicels very short. Glumes 3; lower involucre glume about 0.5 mm. long, broadly oblong, nerveless, hyaline; upper involucre glume 1 mm. long, broadly oblong, hyaline, nerveless, floral glume 2-2.5 mm. long, broadly ovate, 1-nerved, palea plicate in the median line. Stamens 3. Grain 1.2 mm. long, obovoid, quadrangular, truncate, umbonate by the loose pericarp, red-brown, rugulose

Locality : W Ghats Castle Rock, 1,600 ft., rainfall 250 in (Sedgwick 2851 !).

Deccan Chattrashinj Hill, Poona (Ezekiel !); Lina Hill, Nasik Dist. (Blatter A59 !), Kolhapur (Woodrow)

Ecology : A sporadic grass It grows well on almost any kind of land, but does best on rich moist soil. It stands drought well. It is a widespread ruderal species in warm countries.

Distribution : Most warm countries.

Economic uses : Considered a good fodder grass, especially when young. "In the United States this grass is of considerable value for grazing purposes if frequently cut or grazed down, but if allowed to remain untouched long, cattle and horses will not eat it unless they are very hungry, as it becomes tough and unpalatable. It is not used to any considerable extent for hay, but makes splendid feed if cut while young and as a pasture plant" (Duthie).

4. *SPOROBOLUS MINUTIFLORUS* Link.

Sporobolus minutiflorus Link Hort Reg Berol I (1827) 88, Kunth Enum Pl I (1838) 214,

Hook. f. Fl. Brit Ind. VII (1896) 248, Cooke Fl Bomb II (1908) 1019.

Vilfa minutiflora Trin. Gram. Diss. I, 158, Steud. Syn. Gram. 158.

V. capillaris W. & A. ex Wight Cat no 2036 (non Miq.).

V. mangalorea Hochst ex Miq Anal Bot. II, 24, Steud. Ic 158.

V. tenuissima Schult. Mant. II, 47

Panicum tenuissimum Mart. ex Schrank in Denkschr Bot Ger. Regensb. II (1822) 26.

Etymology : *Minutiflorus* means having minute flowers

Description : Stem 60-90 cm. high, slender, smooth, nodes glabrous. Leaves 15-25 cm. by 2-3 mm, flat, finely acuminate, with smooth margins; sheaths long, ribbed, smooth; ligule a minute ring

Panicle 30-45 cm. long, reaching 7-5 cm. broad, effuse, supra-decompound, branches capillary. Spikelets 1 mm long, dark coloured Glumes 3, lower involucre glume about 0.4 mm. long, subquadrate; upper involucre 0.5 mm. long, broadly ovate, subobtusely, nerveless, floral glume 1 mm long, ovate-oblong, subobtusely, nerveless, palea shorter, broad, truncate Stamens 3, quickly falling with age. Grain 0.8 mm. long, obovoid, compressed.

Locality : Konkan : Bombay Island, very common (McCann 4296! 3635!); Parel (Woodrow); Mulgaum (McCann 3660 !).

N. Kanara : Dandeh, 2,000 ft., rainfall 100 in. (Sedgwick & Bell 4220 !); Kumpta (Chibber !).

Distribution : W. Peninsula.

5. *SPOROBOLUS IOCLADOS* Nees.

Sporobolus ioclados Nees Fl. Afr. Austr. (1841) 161; Hook. f. Fl. Brit. Ind. VII (1896) 249; Cooke Fl. Bomb. II (1908) 1019.

Description : An elegant perennial grass; stems 25-45 cm. long, densely tufted, rather stout, erect, smooth, glabrous; nodes glabrous. Leaves 5-10 cm. by 2.5-3 mm., flat or convolute, linear, tapering to a fine point; sheaths ribbed, glabrous, smooth; ligule a pubescent ridge.

Panicle 10-15 by 5-7.5 cm., ovate or subpyramidal, effuse; branches opposite, or alternate, or the lower whorled, spreading, remotely branched, filiform, smooth. Spikelets 2 mm. long, oblong-lanceolate, pale. Glumes 3; lower involucreal glume 0.8 mm. long, oblong-lanceolate, hyaline; upper involucreal glume 1.4 mm. long, ovate, acute, 1-nerved; floral glume 2 mm. long, ovate-lanceolate, acute, 1-nerved; palea slightly shorter than the glume, oblong, obtuse. Stamens 3, anthers 0.8 mm. long. Grain linear-oblong, 0.8 mm. long.

Locality : Sind (Stocks).

Distribution : S. Africa.

6. *SPOROBOLUS VIRGINICUS* Kunth.

PLATE 149.

Sporobolus virginicus Kunth Rev. Gram. I (1829) 67, Enum. Pl. I (1838) 210, Suppl. 167; Hook. f. Fl. Brit. Ind. VII (1896) 249.

Agrostis virginica Linn. Sp. Pl. (1753) 63; Labill. Pl. Nov. Holl. I, 20, t. 23.

A. barbata Pers. Syn. I (1805) 75.

A. littoralis Lamk. Ill. 161.

A. pungens Pursh Fl. Am. Sept. 64.

Podosemum virginicum Link Enum. Hort. Berol. I (1827) 85.

Vilfa virginica Beauv. Agrost. (1812) 16; Trin. Diss. I, 155; Sp. Gram. Ic. t. 48; Baker Fl. Maurit. (1877) 449.

V. barbata Beauv. l. c.

V. littoralis Beauv. l. c.

Sporobolus littoralis Kunth l. cc. 68, 213.

Calotheca sabulosa Steud. in Flora XII (1829) II, 488.

Crypsis maritima Munro ex Macowan in Cape Monthly Mag. N. S. III, 1871, Suppl. 7.

Description : Perennial. Stems erect or ascending from a decumbent woody creeping base, branched, hard and often tortuous at the base, 15-30 cm. high. Leaves strict, close-set, distichous, erect-patent, 2.5-7.5 cm. long or more, narrow and almost terete from the involute margins, pungent, very pale, glabrous or scaberulous above, striate; sheaths terete, short or long; ligule of long soft hairs.

Panicle 2.5-10 cm. long, elongate, narrow, subspiciform, interrupted, very pale; branches very short. Spikelets 2.5-2 mm. long, very shortly pedicelled, crowded. Glumes 3, all 1-nerved, keels glabrous or obscurely scabrid towards the tip. Involucreal glumes oblong-lanceolate, acute, the lower shorter than the upper. Palea oblong, narrowly truncate. Grain broadly obovoid, with a pericarp loosened if moistened.

Locality : *Kathnagar* : Porbandar (Chibber l). Chibber was the first to find this species on the shores of continental India.

Ecology : This is a variable seashore plant.

Distribution : India, Ceylon, westward to Africa and America, eastward to Australia.

Explanation of Plate 149 : *Sporobolus virginicus* Kunth.

1. Lower invol. glume
2. Upper invol. glume.
3. Floral glume.
4. Palea of floral glume.

7. *SPOROBOLUS GLAUCIFOLIUS* Hochst.

PLATE 150.

Sporobolus glaucifolius Hochst. in Flora XXV, pt. 1 (1842) Beibl. 133 (*nomen nudum*); Hook. f. Fl. Brit. Ind. VII (1896) 250; Cooke Fl. Bomb. II (1908) 1019.

Vilfa glaucifolia Steud. Syn. Pl. Glum. (1855) 154.

V. scabryfolius Hochst. ex Edgew. in Journ. Linn. Soc. VI (1862) 196; Aitchis. Cat. Panjab Pl. (1869) 165.

Agrostis barbata β, *senegalensis* Pers. Syn. I (1805) 76.

A. littoralis β, Lamk. Ill. 161; Poir. Encycl. Suppl. I, 251.

Etymology : *Glaucifolius* means having glaucous leaves.



SPOROBOLUS VIRGINICUS KUNTH.

Delin R. K. Bhui



SPOROBOLUS GLAUCIFOLIUS HOCHST.

Description : Perennial, stems 30-45 cm. long, densely tufted, leafy; nodes glabrous. Leaves 3-12.5 cm by 2.5-3 mm, narrowed from a subcordate base to an acuminate tip, strict, glaucous, flat or undulate, not pungent, sheaths ribbed, glabrous, ligule a line of hairs.

Panicle 7.5-12.5 cm. long, contracted, interrupted, pale yellowish white, branches short, erect. Spikelets crowded, 2 mm long, pedicels very short. Glumes 3, lower involucreal glume 1.6 mm long, lanceolate, hyaline, acutely acuminate, 1-nerved, upper involucreal glume 2 mm. long, broader than the lower, ovate-lanceolate, acutely acuminate, hyaline, 1-nerved; floral glume 1.6 mm. long, ovate, acute, 1-nerved, palea as long as the glume. Stamens 3; filaments very short; anthers 0.8 mm long.

Locality : *Sind* Mirpurkhas (Bhide !), fallow fields (Sabnis B1191 !); Jacobabad Bhide), Magarpur, near Karachi (Sabnis B224 !), Karachi (Woodrow 18).

Kathmanwar Porbandar (Woodrow 21 !).

Gujarat. Road to Gogha (Chibber !), dry ricefields, Chandola, Ahmedabad (Sedgwick !).

Konkan. Bombay, fore-shore (Sedgwick 2568 !), Sion (McCann 3677 !).

S. M. Country Khanapur, 2,500 ft, rainfall 60 in. (Sedgwick 3011 !).

Ecology : Grows chiefly on sandy salt land and fallow fields.

Distribution : Punjab, Sind, tropical Africa.

Explanation of Plate 150 : *Sporobolus glaucifolius* Hochst.

1. Spikelet.
2. Lower invol. glume
3. Upper invol. glume
4. Floral glume
5. Palea of floral glume.
6. Grain and styles.

8. *SPOROBOLUS TREMULUS* Kunth.

Sporobolus tremulus Kunth Rev. Gram. I (1829) 67, Enum. Pl. I (1838) 210, Suppl. 166, Hook. f. Fl. Brit. Ind. VII (1896) 250, Sedgwick & Saxton in Rec. Bot. Surv. India VI, 219; Haines Bot. Bih. and Or. (1924) 974.

Agrostis tremula Willd. Sp. Pl. I, 372 (excl. syn.).

A. juncea Lamk. Encycl. I, 60, Ill. t. 41, fig. 2.

A. tenacissima Roxb. Fl. Ind. I (1832) 316 (excl. syn.).

Vulfa tremula Trin. Diss. I, 155.

V. gemiculata Nees ex Steud. Syn. Pl. Glum. (1855) 156.

V. orientalis Wight Cat. no. 1745 (partim).

Sporobolus gemiculatus Nees ex Hitchc. Cat. Punjab Pl. (1869) 165.

S. orientalis Trin. Cat. Ceyl. Pl. 108 (non Kth.).

Etymology : *Tremulus* means trembling.

Description : A small grass, 2.5-30 cm. high, erect or prostrate, wiry, strict, often tufted, from a hard, knotted stoloniferous stock, stolons 15-45 cm. long, stout or slender, leafy, flexuous. Leaves short, 1-5 cm. long, rigid, subulate or filiform, flat or convolute, pungent, narrowed from the usually hairy base to the tip, margins smooth. Ligule a few hairs.

Panicle narrow, 2.5-10 cm. long, subspiciform, sometimes longer, flexuous and interrupted, with erect branches, rarely a few spreading. Spikelets crowded, 1-5 mm. long, articulate on very short pedicels half their own length or less, very pale, rachilla readily disarticulate above the lowest glumes and these also separately falling. Glumes all 1-nerved. Lower involucreal glume about $\frac{1}{2}$ of the floral glume, lanceolate, upper involucreal glume and floral glume subequal. Palea as long as its glume. Stamens 3. Grain oblong.

In habit it resembles *Cynodon* and is liable to be passed over.

Locality : *Gujarat.* Sides of the Chandola Tank which are submerged in the monsoon (Sedgwick !).

S. M. Country. Kunnur, margins of tanks, 2,000 ft, rainfall 35 in. (Sedgwick & Bell 4936 !); Marrikop, margins of tanks, west of Dharwar, 1,800 ft, rainfall 35 in. (Sedgwick & Bell 4495 !); Rambennur, grassy plain; near water (Bhide !).

Ecology : Grows on grassy margins of tanks. A gregarious plant.

Distribution : India, Ceylon, Burma, Tonkin, Cambodia.

9. *SPOROBOLUS ORIENTALIS* Kunth.

Sporobolus orientalis Kunth Enum. Pl. I (1838) 211; Dalz. & Gibs. Bomb. Fl. (1861) 295; Hook. f. Fl. Brit. Ind. VII (1896) 251, Cooke Fl. Bomb. II (1908) 1020; Duthie Fodder Grasses N. Ind. (1883) 49; Trin. Fl. Ceyl. V, 263.

Agrostis orientalis Nees Agrost. Bras. 393 (excl. syn. Roxb.).

A. tenacissima Linn. f. Suppl. (1781) 107 (*excl. syn.* Jacq.).

A. elongata Roth Nov. Sp. Pl. (1821) 41.

Vilfa orientalis Nees ex Trin. in Mem. Acad. Petersb. ser. VI, So. Nat. II (1840) 65; Steud. Syn. Pl. Glum. (1855) 156.

V. diandra Trin. Diss. I, 154 (*excl. syn.* Retz.).

Sporobolus humifusus Trim. Cat. Ceyl. Pl. 108 (*non* Kunth).

Vernacular name : Shapia, Kal, Usar-ki-ghas

Description : Stoloniferous, growing on saline soils; stolons stout or slender, rooting at the nodes; stems 15-45 cm. high, stout at the base, hard, branching; branches and flowering stems usually geniculate below. Leaves coriaceous, variable, 2.5-20 cm. by 2.5-4 mm., usually more or less pungent, tapering to the tip, glabrous or hairy above and with scabrous or subserrulate margins; sheaths close, glabrous; ligule a slender ciliate membrane.

Panicle narrow, oblong; branches 13-20 mm. long, suberect. Spikelets 2.5 mm. long. Glumes 3, hyaline; lower involucre glume 0.7 mm. long, ovate-oblong, obtuse, nerveless; upper involucre glume 2.5 mm. long, ovate, subobtusely, 1-nerved; floral glume ovate-oblong, obtuse, scarcely longer than the upper involucre glume, 1-nerved; palea ovate-oblong, obtuse, slightly shorter than the glume.

Locality : Cutch : Kari Roa (Blatter 3771!).

Gujarat : Prantj Taluka, low grounds liable to inundation (Sedgwick!);

Umrat, on salt land (Woodrow!).

Konkan : Bassein (McCann 4481!).

N. Kanara : Karwar, borders of ricefields (Talbot 1531!).

Ecology : This grass grows in dry, sandy or saline soils. See Duthie, Fodder Grasses of N. India 49

Distribution : Punjab, W. Peninsula, Ceylon.

Economic uses : Considered as good fodder grass.

10. SPOROBOLUS FILIFERUS Kunth.

PLATE 151.

Sporobolus piliferus Kunth Enum Pl. I (1838) 211; Hook. f. Fl. Brit. Ind. VII (1896) 251; Cooke Fl. Bomb. II (1908) 1020

Vilfa pilifera Trin. Diss. I, 157, II, 23, Sp. Gram. Ic. t. 58.

Sporobolus ciliatus Munro in Herb. Ind. Or. Hook. f. & T. ex Hook. f. Fl. Brit. Ind. VII (1896)

251, Duthie Grasses N. W. Ind. (1883) 29 (*non Vilfa ciliata* Presl).

Trachyrum mlagricum Steud. in Hohen. Pl. Ind. Or. no. 931.

Etymology : *Piliferus* means hair-bearing

Description : Annual; stems 7.5-30 cm. high, tufted, erect; roots fibrous. Leaves 2.5-10 cm. by 1.6-2.5 mm., chiefly radical, narrowed from the base to a fine point, flat or convolute, with scabrid or subserrulate margins; sheaths hairy at the mouth; ligule a minute narrow line.

Panicle linear, 2.5-7.5 cm. long, strict, erect, dense-flowered, often interrupted; branches very short, erect. Spikelets 1.6-2 mm. long, pale brown; pedicels short. Glumes 3; lower involucre glume 1.2 mm. long, ovate-lanceolate, hyaline, nerveless; upper involucre glume 2 mm. long, oblong-lanceolate, 1-nerved, slightly longer than the floral glume; floral glume 1.6 mm. long, oblong, obtuse, 1-nerved, palea oblong. Stamens 2. Grain ellipsoid, compressed, with a very loose pericarp, reddish brown.

Locality : W. Ghats : Panchgani, Tableland, 4,300 ft., rainfall 60 in. (Sedgwick & Bell 4693!; Blatter & Hallberg B1319! B1320!, McCann!).

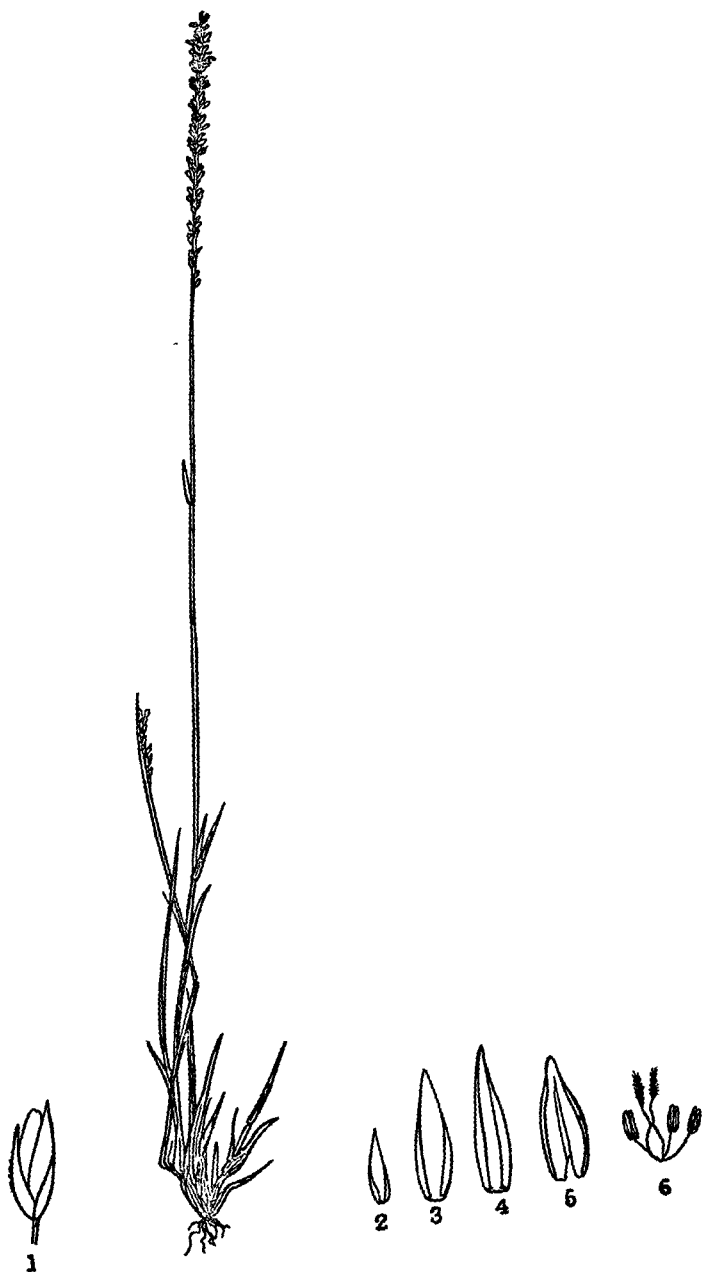
S. M. Country : Dharwar (Bhide!); Belgaum (Ritchie 836).

Ecology : A subgregarious plant.

Distribution : W. Himalaya, Khasia Hills, Nilgiris, W. Peninsula, Malacca.

Explanation of Plate 151 : *Sporobolus piliferus* Kunth

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
6. Stamens, ovary and styles.



SPOROBOLUS PILIFERUS KUNTH

Delin: E. K. Bhide.



SPOROBOLUS PALLIDUS BOISS.

11 *SPOROBOLUS PALLIDUS* Boiss.

PLATE 152.

Sporobolus pallidus Boiss. Fl Or V (1884) 514 (non Lindl.), Aitchis Cat Panjab Pl (1869) 165 (excl. syn).

Vilfa pallida Nees ex Trin. in Mem Acad. Petersb ser VI, Sc. Nat II (1840) 62, Steud. Syn Pl. Glum. (1855) 155

Sporobolus arabicus Boiss Diagn. Pl. ser I, XIII (1853) 47, Hook. f Fl Brit Ind. VII (1896) 252, Cooke Fl Bomb. II (1908) 1020

Vilfa arabica Steud. l. c. 241.

Hook. f. calls the synonymy of this plant a perplexing one, "owing to the double use of the specific name *pallidus*, and to the fact of *Vilfa* being now regarded as a synonym of *Sporobolus*. This name (*pallidus*) was applied by Nees in 1840 to the Arabian plant described above, under *Vilfa*; and by Lindley in 1848 to a very different Australian one, under *Sporobolus*. Bentham (Fl. Austral. VII, 623), assuming that Nees had referred his plant to *Sporobolus*, renamed Lindley's *S. Lindleyi*. Lastly, Boissier, when he founded his *S. arabicus*, was not aware that it was Trinus's *Vilfa pallida*, which he erroneously cites in Fl. Orient., under *Sporobolus pallidus*, Trin. In this case the proper course appears to me to be to retain the name *Sp. pallidus*, Lindl., for the Australian plant, and *Sp. arabicus*, Boiss., for the Arabian and Indian." In spite of these reasons we have to call this species *S. pallidus* Boiss., as *Vilfa pallida* Nees is the oldest name for the Indo-Arabian species. Another name will have to be found for the Australian plant.

Etymology: *Pallidus* means pale

Description: Perennial, stems many from a woody stoloniferous base, sometimes as thick as the middle finger, and sending out rigid often geniculate stolons and stout or slender flowering branches 15-60 cm. high. Leaves 2.5-25 cm. by 3-4 mm., rigid, narrowed to the tip from the rounded base, flat or convolute, scaberrulous above, with finely ciliate-serrulate margins, sheaths glabrous, ligule a fringe of hairs.

Panicle 5-15 cm. long, effuse, branches whorled, capillary, reaching 3-8 cm. long, naked below, with spikelets spicately arranged on the short branchlets. Spikelets 2.5 mm. long; pedicels short. Glumes 3, lower involucre glume 0.8 mm. long, ovate, subobtusate, hyaline, nerveless; upper involucre glume 2.5 mm. long, oblong, obtuse, 1-nerved; floral glume as long as the upper involucre glume, oblong, obtuse, 1-nerved, palea as long as the glume. Grain subglobose.

Locality: *Sind* (Burns !); *Laki* (Bhude !), *Mirpur Sakro* (Blatter & McCann D672 ! D677 ! D678 !); *Gharo* (Blatter & McCann D673 ! D676 !); *Tatta* (Blatter & McCann D674 ! D675 !); *Jemadar ka Landa*, near *Karachi* (Stocks 663), *Karachi* (Woodrow), between *Karachi* and *Nagar Peer* (Wykeham Perry).

Distribution: Punjab, Waziristan, Rajputana Desert, Afghanistan, Baluchistan, Arabia.

Explanation of Plate 152: *Sporobolus pallidus* Boiss.

- 1 Spikelet.
- 2 Lower invol. glume
3. Upper invol glume
- 4 Floral glume.
5. Palea of floral glume
6. Stamens and grain

12. *SPOROBOLUS SCABRIFOLIUS* Bhude

Sporobolus scabrifolius Bhude in Journ. & Proc. As Soc Beng. new ser VIII (1912) 312, pl. XXV, Blatter & McCann in Journ Bomb Nat. Hist Soc 33 (1929) 485.

Etymology: *Scabrifolius* means having scabrous leaves.

Description: Stems erect, 20-75 cm. high. Nodes glabrous. Leaves 2.5-12 cm. long, 3-9 mm. broad, lanceolate, rounded or subcordate at the base, hairy on both surfaces with bulbous based hairs, margins slightly thickened and spinulosely serrulate, sheaths glabrous; ligule a fringe of hairs.

Panicle 7.5-17.5 cm. long, 2.5-9 cm. diam., branches whorled or fascicled, a few solitary ones or twigs intervening. Spikelets about 1 mm. long. Glumes 3; involucre ones empty, ovate, acute, membranous, 1-nerved, the lower one $\frac{1}{2}$ the size of the upper; flowering glume just a little shorter than the upper involucre, ovate, acute, membranous, 1-nerved, apleate, bisexual; pale shorter than the glume. Stamens 3; styles 2; stigmas plumose. Grain rounded, slightly beaked at the extremities, lodicules minute.

Locality: *S. M. Country:* Ranibennur (Bhude !); Haveri (Talbot 2176 !)

Distribution: So far endemic.

13. *SPOROBOLUS COROMANDELLANUS* Link.

PLATE 153.

Sporobolus coromandelianus Link Hort. Reg. Berol. I (1827) 89 (*in nota*), Kunth Rev. Gram. I (1829) 68, Dalz. & Gibs Bomb. Fl. (1861) 296, Hook. f. Fl. Brit. Ind. VII (1896) 252; Cooke Fl. Bomb. II (1908) 1021; Haines Bot. Bh. and Or. (1924) 975.

Agrostis coromandeliana Retz. Obs. IV (1786) 19, Vahl Symb. I, 10, Roxb. Fl. Ind. I (1832) 316.

A. indica Forsk. Fl. Aeg.-Arab. (1775) 104.

Vilfa coromandeliana Beauv. Agrost. (1812) 15, Trin. Sp. Gram. Ic. t. 11 (*omittens glumam involucri inferiorem*), Steud. Syn. Pl. Glum. (1855) 153.

V. commutata Trin. Diss. I, 156.

V. discospora Trin. in Mem. Acad. Petersb. ser. VI, Sc. Nat. II (1841) 59.

V. Roxburghii Nees ex Trin. l. c.

V. Roxburghiana Nees ex Wight Cat. no. 1742; Steud. Nom. ed. II, II, 59.

Sporobolus commutatus Kunth Enum. I, 214; Miq. Fl. Ind. Bat. III, 376 (*excl. syn. pulchello*); Boiss. Fl. Or. V (1884) 513, Aitchis. Cat. Panjab Pl. (1869) 165, Duthie Grasses N. W. Ind. (1883) 29.

S. discosporus Nees Fl. Afr. Austr. (1841) 158.

Trachyrum cordofanum Hochst. ex Steud. Syn. Pl. Glum. (1855) 176.

Description: Annual, densely tufted, stems 10-30 cm. long, erect, ascending or often spreading from the root, copiously leafy at the base. Leaves 2.5-7.5 cm. by 3-6 mm. linear-lanceolate, narrowed from the subcordate base to the acuminate tip, spinulose-toothed especially towards the base, lower sheaths short, terete or compressed, the upper long, hairy at the mouth, ligule a narrow membrane fringed with long fine hairs.

Panicle 5-10 by 2.5-6.3 cm., ovate or pyramidal, branches capillary in rather distant whorls of 3-6, horizontally spreading, naked below, sparingly shortly divided upwards, bearing short minute red spikelets about 1.2 mm. long on short pedicels. Glumes 3, hyaline; lower involucre glume very minute, suborbicular, nerveless, upper involucre glume 1.2 mm. long, ovate-oblong, subacute, 1-nerved; floral glume as long, oblong, obtuse, 1-nerved; palea as long as the glume. Stamens 3, anthers small. Grain broadly ellipsoid, compressed, smooth, enclosed in the loose somewhat fleshy reticulate pericarp, pale reddish brown.

Locality: Sind. Jemadar ka Landa, near Karachi (Stocks).

Gujarat: Shady places at Dhansura, Modasa-Petha (Sedgwick!).

Khandesh: Bor, Boru River (Blatter & Hallberg 4426!).

Konkan: Kennedy seaface, Bombay (Sabnis 4295!), Bombay (Law).

Deccan: Poona, College Farm (Khomae!); Gungapur (Blatter A56!).

S. M. Country: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 2832!).

Ecology: A sporadic species. Common in the Carnatic.

Distribution: Punjab, Orissa, Burma, W. Peninsula, Ceylon, Afghanistan, Africa.

Explanation of Plate 153: *Sporobolus coromandelianus* Link.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume
5. Palea
6. Stamens and grain

TRIBE XI: Eragrostaceae.

Spikelets pedicelled and variously paniced, or sessile or subsessile in spikes (or spike-like racemes) which are racemously arranged on an elongated common axis. Florets usually numerous (1 in *Leptochloa* sp.) and far exserted from the involucre glumes. Involucral and floral glumes rather similar in general appearance. Floral glumes membranous to subcoriaceous, very often olive-green or olive-grey, entire or slightly emarginate with the nerves evanescent above or percurrent to obscurely excurrent, mucous, mucronulate, very rarely with a very short awn from below the tip (*Diplachne* sp.).

See key page xix.



SPOROBOLUS COROMANDELIANUS LINK.

Deskn R K Bhidi

81 ERAGROSTIS Beauv¹

Annual usually slender glabrous grasses of various habit, stems erect or ascending. Leaves narrow; ligule usually reduced to a line of hairs.

Spikelets 2-many-flowered, in open or contracted panicles (rarely spicate), strongly laterally compressed, ovate-oblong or linear, not (or rarely) articulate on their pedicels on a simple terminal rhachis, rhachilla disarticulating above the involucrel glumes and between the floral ones, or tough and persistent, not produced beyond the upper floret. Glumes many, broad, obtuse, acute or mucronate, never awned, thin, dorsally rounded and keeled, involucrel glumes much shorter than the spikelet, equal or unequal, empty, persistent or separately deciduous, 1- (rarely 3-) nerved, usually membranous, floral glumes imbricating, at length deciduous from the rhachilla, 3-nerved, all 2-sexual or the uppermost and rarely the lowest imperfect, ovate to lanceolate, membranous to chartaceous, usually glabrous, the lateral nerves short, not reaching the midnerve; paleae equal to their glumes or slightly shorter, membranous, 2-keeled, deciduous or persistent on the rhachilla. Lodicules 2, small, cuneate, more or less fleshy. Stamens 3 (rarely 2). Styles distinct, stigmas plumose, laterally exserted. Grain minute, globose, oblong, ovoid or obovoid, free in the glume and palea.

Species about 250.—Tropical and temperate regions

Cooke describes 15 species. Of these *Eragrostis cynosuroides* Beauv. has been put under *Desmostachya*. The other species are being retained, with the exception that *E. tenella* var. *viscosa* Stapf is considered as a distinct species (*E. viscosa*). Of 4 species the names had to be changed, viz., *E. rupestris* is substituted for *E. ciliata*, *E. amabilis* is here called *E. unioloides*. *E. stenophylla* becomes *E. nutans*, and *E. major*, *E. cihanensis*, *E. papposa* and *E. brachyphylla* are new to the Presidency.

A. Spikelets panicle.

AA. Rhachilla of spikelets more or less jointed and breaking up from above downwards

- I. Panicle spiciform, compact, 5-7.5 cm. by 8 mm., rhachis bearded at the nodes; margins of flowering glumes ciliate . . . 1 *E. rupestris*.

II. Panicle open or more or less contracted, margins of flowering glumes not ciliate . . .

1. Spikelets 5 mm. long, panicle large, lax, thyrsiform, 20-50 by 10-15 cm. . . 2 *E. aspera*.
 2. Spikelets 2-5 mm. long, panicle short, compact, cylindric, 12-40 mm. long . . . 3 *E. ciliaris*.
 3. Spikelets 2-5.4 mm. long; panicles 5-20 cm. long.
 a. Grain ovoid. Stamens 3.
 aa. Not sweet-scented . . . 4. *E. tenella*.
 bb. Sweet-scented . . . 5. *E. viscosa*.
 b. Grain obovoid. Stamens 2 . . . 6. *E. interrupta*.

BB. Rhachilla of spikelets tough, persistent; flowering glumes falling away from its base upwards.

- I. Spikelets flat, ovate-elliptic or oblong, lateral nerves of flowering glumes very prominent, straight, almost percurrent, paleae deciduous with their glumes . . . 7. *E. unioloides*.
 II. Spikelets less compressed, linear or linear-oblong, lateral nerves less prominent. When spikelets compressed or lateral nerves prominent, then with persistent paleae
 1. Spikelets more or less fascicled on the primary or secondary branches or shortly pedicellate in narrow racemes.
 a. Leaves glaucous, grain oblong . . . 8. *E. gangetica*.
 b. Leaves not glaucous; grain globose or nearly so . . . 9. *E. nutans*.

¹ Hitchcock ascribes the genus to Nees because Nees was the first to describe a species of *Eragrostis* (Gram. Austr. 4 (1899) 14, pl. 24). Nees, however, did not give a diagnosis of the genus and so we retain Beauvois who first diagnosed the genus, 1 a.

2. Spikelets not fasciated, long-pedicellate, more or less divaricate when ripe.

a. Leaf-margins glandular.

- aa. Lower involucre glume 1-3-nerved;
upper 3-nerved . . . 10. *E. cilianensis*.
bb. Both involucre glumes 1-nerved . . . 11. *E. minor*.

b. Leaf-margins eglandular, involucre glumes 1-nerved.

- aa. Spikelets versatile, 2.5 cm. long or longer, narrowly linear; branches of panicle solitary . . . 12. *E. tremula*.
bb. Spikelets small, 4 mm. long or less.
§ Mouth of leaf-sheath naked . . . 13. *E. tenuifolia*.
§§ Mouth of leaf-sheath bearded.
† Perennial. Grain obovoid . . . 14. *E. papposa*.
†† Annual. Grain ellipsoid . . . 15. *E. pilosa*.

B. Spikelets distichously spreading, secund, in a long, simple terminal spike.

1. Keels of palea distinctly winged . . . 16. *E. byfaria*.
2. Keels of palea not winged . . . 17. *E. brachyphylla*.

1. *ERAGROSTIS RUPESTRIS* Steud.

Eragrostis rupestris Steud. Syn. Pl. Glum. (1855) 265.

Poa rupestris Roth Nov. Pl. Sp. (1821) 71.

Eragrostis ciliata Nees Agrost. Bras. (1829) 512, Obs 1 (*nomen nudum*); Wight Cat. no. 1788; Steud. Syn. Pl. Glum. (1855) 265; Dalz. & Gibs. Bomb. Fl. (1861) 298; Hook. f. Fl. Brit. Ind. VII (1896) 313; Cooke Fl. Bomb. II (1908) 1022; Haines Bot. Bih. and Or. (1924) 956.

Poa ciliata Roxb. Fl. Ind. I (1832) 334

Etymology : *Eragrostis* is derived from the Greek *eros*, love, and *agrostis*, grass, in allusion to the loose dancing spikelets—*Rupestris* means rocky, a habitat name.

Description : Perennial; stems 30-75 cm. long, erect or geniculate ascending, terete. Leaves linear-lanceolate, finely acuminate, spreading, 5-15 cm. by 2.5-4 mm., flat or convolute, smooth, glabrous, sheaths bearded at the mouth, ligule of a few hairs.

Panicle spiciform, 5-7.5 cm. by 8 mm., cylindrical, compact, branches much shortened; rachis finely bearded at the nodes. Spikelets 2.5-4 mm. long, much compressed, 6-12-flowered. Involucre glumes ovate, acute, hyaline, ciliate; floral glumes 1.6-3.2 mm. long, broadly ovate, cuspidately acuminate, subhyaline, very minutely scaberrulous, the margins ciliate and the nerves prominent; palea shorter than its glume with ciliate keels. Grain ovoid to ellipsoid, 0.5 mm. long, terete.

Locality : Gujarat. Dumas, near Surat (Dalzell & Gibson).—We have never come across this species.

Distribution : India, Cochin-China.

2 *ERAGROSTIS ASPERA* Nees.

Eragrostis aspera Nees Fl. Afr. Austr. (1841) 408, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 386, Hook. f. Fl. Brit. Ind. VII (1896) 314, Cooke Fl. Bomb. II (1908) 1023.

E. paniculata Steud. Syn. Gram. 278.

Poa paniculata Roxb. Fl. Ind. I, 340.

P. aspera Jacq. Hort. Vindob. III (1770-76) 32.

Etymology : *Aspera* means rough.

Description : Annual, stems 20-50 cm. high (excluding the panicle), stout, suberect, usually tufted, smooth and shining, nodes glabrous. Leaves 20-45 cm. by 4-6 mm., linear, flat, glabrous, sheaths bearded at the mouth, otherwise glabrous; ligule a fringe of long hairs.

Panicle lax, open, thyrsiform, oblong to obovate-oblong, 20-50 by 10-15 cm., rachis terete, scaberrulous, bearded at the nodes, branches solitary or falsely whorled, capillary, loosely and repeatedly divided from near the base; pedicels longer than the spikelets, very slender. Pedicels scattered, linear-oblong, 5 by 1 mm., erect, 4-16-flowered; rachilla very slender breaking up. Involucre glumes subequal, oblong, obtuse, 1 mm. long, 1-nerved;

floral glumes about 1.6 mm. long, obliquely ovate-oblong, with prominent nerves, palea obscurely and obtusely 3-lobed, the keels scabrid. Stamens 3; anthers 0.5 mm long. Grain subglobose, about 0.4 mm diam.

Locality : *Konkan* (Lisboa !)

S. M. Country. Hubli, in water-hole, 2,000 ft, rainfall 30 in. (Sedgwick & Bell 4230 !), in a small tank near Dharwar, 2,500 ft, rainfall 34 in. (Sedgwick 1814 !); common in the water-holes in the Naval Tract (Sedgwick)

N. Kanara (Lisboa).

Ecology : Very abundant in muddy places where water stagnates. A subregiarous species.

Distribution : W. Peninsula, S. India, Ceylon, tropical and S. Africa, Isle of France.

3 ERAGROSTIS CILIARIS Link.

PLATE 154.

Eragrostis ciliaris Link Hort. Reg. Berol. I (1827) 192; Boiss. Fl. Or. V (1884) 582; Baker Fl. Maurit. (1877) 456, Duthie Grasses N. W. Ind. (1883) 37, Fodder Grasses N. Ind. (1888) 62; Aitchis Cat. Panjab Pl. (1869) 169, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 380; Hook. f. Fl. Brit. Ind. VII (1896) 314, Cooke Fl. Bomb. II (1908) 1023

Poa ciliaris Linn. Sp. Pl. (1753) 102

Eragrostis lobata Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 396

E. lepidula Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 424.

E. plumosa Boiss. Fl. Or. V (1884) 582 (excl. syn.).

E. pulchella Parl. in Hook. Niger Fl. (1841) 186

E. arabica Jaub. & Spach. Ill. Pl. Or. IV, 31, t. 322.

Megastachya ciliaris Beauv. Agrost. (1812) 74.

Stapf (in Hook. f. Fl. Brit. Ind. I c) distinguishes 2 varieties:

a. *var. ciliaris proper* Stapf. Panicle spiciform, more or less lobed or interrupted.

b. *var. brachystachya* Boiss. Fl. Or. V, 582. Panicle short, compact, cylindric.

In our opinion the many intermediate forms make it practically impossible to keep up this varietal distinction. The above synonymy and the following description are such as to include both varieties.

Vernacular names : Undar-puncho, Tor chandbol, Burbudi.

Etymology : *Ciliaris* means ciliate, alluding to the long-ciliate keel of the palea.

Description : Annual. Stem 15-60 cm high, procumbent below and geniculate ascending, slender, glabrous, smooth. Leaves very narrow, flat, tapering to a fine point; sheaths striate, usually bearded at the mouth with long hairs, ligule a fringe of short hairs.

Panicle 1-1.5 cm long, spiciform, more or less lobed or interrupted, or short, compact and cylindric, appearing hairy from the long cilia of the paleae, branches very short, divided from the base, glabrous; nodes of glabrous rachis naked; pedicels very short, glabrous. Spikelets 2.5 mm long and broad, crowded, 6-12-flowered, strongly compressed, very pale, rachilla breaking up. Involucral glumes subequal, ovate-lanceolate, acute, 1.5 mm long. Floral glumes about 1 mm long, oblong, subtruncate, mucronulate, spreading, lateral nerves submarginal. Paleae equal to their glumes and falling with them, the keels with long rigid cilia. Stamens 3; anthers very short. Grain elongate-ovoid, about 0.5 mm long.

Locality : *Sind.* Karachi (Burns !); Jemadar Ka Landa, near Karachi (Stocks); Mirpurkhas (Sabnis B1175 !); Mirpurkhas Farm, Mankad (Herb. Econ. Bot. !), Jamesabad, in fields (Sabnis B1109 !); Nasarpur, clayey soil (Sabnis B1058), Sanghar (Sabnis B757 !), Tatta (Blatter & McCann D649 !)

Cutch : Bhuj Hill (Blatter !).

Kathnawar. Porbandar (Blatter !).

Gujarat. Baroda (Woodrow), Domas, near Surat (Blatter !), Nadiad (Chibber !); Broach (Woodrow !); Sungri (Gammie 16553 !); Perim Isl., Gulf of Cambay (Blatter !).

Khandesh : Taner, Tapta bank (Blatter & Hallberg 5166 !), Nim, Tapta bed (Blatter & Hallberg 5400 !); Tapta Isl. near Bor, on sand and mud (Blatter & Hallberg 4394 !); Bor, Bori River (Blatter & Hallberg 4423 !), Amalner, Bori River (Blatter & Hallberg 5114 !).

Konkan. St. Xavier's College, compound (McCann 4596 ! 4527 !), Alibag, sandy shore (Ezekiel !).

Deccan : Trimbak, Nasik Dist. (Chibber !).

N. Kanara : Honavar (McCann !).

Ecology : Grows generally in sandy soil. This grass which is abundant at Surat, is not found in the Carnatic.

Distribution : India, Arabia, tropical Africa and America.

Economic uses : Affords good grazing, wherever it is found in sufficient quantity.

Explanation of Plate 154 : *Eragrostis ciliaris* Link.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume
4. Floral glume
5. Palea.
6. Grain.

4. *ERAGROSTIS TENELLA* P Beauv.

Eragrostis tenella P. Beauv. ex Roem. & Schult. Syst. II (1817) 576 ; Stapf in Hook. f. Fl. Brit. Ind VII (1896) 315 ; Cooke Fl. Bomb. II (1908) 1023.

Poa amabilis Linn. Sp. Pl. (1753) 68

Poa tenella Linn. Sp. Pl. (1753) 69

A. Camus in Lecomte's Flore Général de l'Indo-Chine has adopted the name *Eragrostis amabilis* for this species. Mr. Hubbard of Kew has informed us that, according to the Vienna Rules of nomenclature (Art. 46) this does not seem to be correct. *Poa amabilis* Linn. is the same as *Poa tenella* Linn., and *Eragrostis tenella* P. Beauv. ex Roem. & Schult. is based on *Poa tenella* Linn. Apparently Stapf (in Hook. f. F. B. I. VII, 315) was the first to unite the two species ; as the name first used when the species were united takes precedence over the other, we have to retain the name *E. tenella* P. Beauv.

Vernacular names : Dhane, Bharbhuri, Bharbusi, Bara-churbhura, Ichcoi.

Etymology : *Tenella* means tender, delicate.

Description : Usually a small, very elegant and slender annual grass, very variable, rarely 45 cm. high. Stems many, slender, densely tufted. Leaves slender, narrow, acuminate, attaining 12 cm. by 5 mm., usually much less ; sheaths long-ciliate near the mouth.

Panicles decompound, excessively branched, 5-20 cm. long, contracted or spreading, pale green or purplish, oblong-ovate or cylindrical, never with the long interrupted rhachis and pseudoverticillate branches of *E. interrupta*. Spikelets innumerable, minute to small on capillary branchlets and pedicels, 1-4 mm. by 1 mm. or less, not strongly compressed, 3-9-flowered. Involucral glumes subequal or unequal. Flowering glumes oblique, not mucronate, lateral nerves remote from the margins, keels of palea usually obscurely ciliate. Stamens 3. Grain broadly ovoid, pale brown, polished.

VAR. *PLUMOSA* Stapf.

PLATE 155.

Var. plumosa Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 315 ; Cooke Fl. Bomb. II (1908) 1024 ; Haines Bot. Bih. and Or. (1924) 957.

Eragrostis plumosa Link Enum. Hort. Berol. I (1827) 192 (*non* Boiss.), Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 64, t. 38, 77, Arcthis. Cat Panjab Fl. (1869) 170 ; Lasboa in Journ. Bomb. Nat. Soc. VI (1893) 385.

Poa plumosa Retz. Obs. IV (1786) 20, Kunth Enum. Pl. I (1838) 338 ; Roxb. Fl. Ind. I (1832) 337.

P. tenella Linn. Sp. Pl. (1753) 69, Burm. Fl. Zeyl. t. 47, fig. 3, Retz. Obs. V (1789) 19.

P. despicens Link Enum. Hort. Berol. I (1827) 88

Eragrostis despicens Schult. Mant. II, 318.

Description : Stems tufted, sometimes reaching 40 cm. high and more, and as well as the panicle eglandular. Panicle delicate, open, often flexuous ; branches capillary, rhachis bearded at the nodes ; pedicels distinct, often long. Spikelets 1.2-4 mm. long, 3-9-flowered, rhachilla subarticulate. Involucral glumes unequal, the lower distinctly shorter than the upper. Floral glumes less than 1 mm. long. Keels of the palea pectinately ciliate with long hairs. Anthers minute. Grain ovoid, less than 0.5 mm. long.

Locality : Sind - Mirpurkhas, on banks of dry watercourse (Sabnis B1023 !).

Gujarat - Surat (Bhide !, Woodrow).

Khandesh - Bor, Tapta Island, sandy mud (Blatter & Hallberg 4395 !); Umalla, Tapta bank (Blatter & Hallberg 5230 !); Chanseh (McCann 9978 !).

Konkan : Common (Lasboa) ; Byculla, common in Bombay Island (McCann A1 !); Uran (Hallberg & McCann 5124 ! 5131 !).

Deccan - Sholapur (D'Almeida 9977 !); Poona (Cooke, Woodrow).

S. M. Country : Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 2830 !), Yelvigti, 1,800 ft., rainfall 30 in. (Sedgwick 2035 !), Badami (Bhide !), Gokak (Shevade !).

N. Kanara - Halyal (Talbot 2383 !).



ERAGROSTIS CILIARIS LINK.

Delin: R. K. Blake



ERAGROSTIS TENELLA P. BEAUV. VAR. PLUMOSA STAFF.

Delin: B. K. Bh

Ecology : A subgregarious species. Common in pasture ground.

Distribution : Throughout India and Ceylon.

Economic uses : Eaten by cattle both fresh and dry. The grain is said to be nutritious.

Explanation of Plate 155 : *Eragrostis tenella* Beauv. var. *plumosa* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

Var. riparia Stapf in Hook. f. Fl. Brit. Ind. VII, 315; Cooke, Fl. Bomb. II (1908) 1024.

Cooke included this variety on the authority of Graham (Cat. Bomb. Pl. p. 236, under *Poa Tenella*). Graham does not give any locality; Cooke has not seen any specimens from the Presidency, and we have not found it anywhere in our area. We, therefore, drop this variety.

5. ERAGROSTIS VISCOSA Trin.

Eragrostis viscosa Trin. in Mem. Acad. Petersb. ser. 6, I (1831) 397; Dalz. & Gibs. Bomb. Fl. (1861) 298; Lasboia in Journ. Bomb. Nat. Hist. Soc. VII (1893) 386; Haines Bot. Bih. and Or. (1924) 957.

Poa viscosa Retz. Obs. IV (1786) 20; Roxb. Fl. Ind. I (1832) 336; Grah. Cat. Bomb. Pl. (1839) 236; Kunth Enum. Pl. I (1838) 336.

Eragrostis tenella var. *viscosa* Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 315; Cooke Fl. Bomb. II (1908) 1024.

Vernacular names : Bhurbur, Bhurbusi, Chikta, Bhulni, Chpal.

Etymology : *Viscosa* means viscid, alluding to the microscopic glands on many parts of the plant.

Description : A tufted, sweet-scented grass, 15-40 cm. high, the panicles occupying the greater part of the plant. Stem and rachis of panicle, pedicels and glumes with scattered microscopic glands. Leaves mostly convolute, erect-patent, 2.5-3.5 cm. long with rigid tips, base and mouth of sheath with very long cilia.

Panicles dense, cylindric or oblong, 7-13 cm. long and up to 3.5 cm. broad. Branches very numerous, more or less spreading, equal, sometimes opposite or 2-nate, but never in interrupted whorls as in *E. interrupta*; rachis usually glabrous, rarely obscurely bearded at the nodes. Spikelets 5-20-flowered, often purplish, usually about 3 mm. long; rachilla readily breaking up. Involucral glumes nearly equal or the lower very slightly shorter than the upper. Floral glumes broadly ellipsoid, obtuse or rounded, with the keel minutely scaberulous. Palea nearly as long as the glume, rigidly ciliate on the keels. Grain pale brown, polished, about 0.5 mm. long.

Locality : *Kathawar* : Junagad (Blatter 3282! 3791!).

Khandesh : Bor, Bori River (Blatter & Hallberg 4430!); Amalner, Bori River (Blatter & Hallberg 5113!); Num, Tapi bank (Blatter & Hallberg 3829!); Dadgaum (McCann A11!).

Konkan : Malabar Hill, Bombay.

W. Ghats : Khandala; Panchgam (Blatter & Hallberg B1280!).

S. M. Country : Dastikop, fields, 2,500 ft., rainfall 35 in. (Sedgwick & Bell 1898!).

N. Kanara : Sulgeri, 500 ft., rainfall 200 in. (Sedgwick & Bell 3250!); Birchy (Talbot 2102!).

Ecology : A subgregarious species. Common in damp places.

Distribution : From the Gangetic Plains southward, Ceylon, tropical and S. Africa.

Economic uses : Eaten by cattle both fresh and dry.

6. ERAGROSTIS INTERRUPTA Beauv.

Eragrostis interrupta Beauv. Agrost. (1812) 71 (*non* Roem. & Schult. *neque* Trin.); Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 316; Cooke Fl. Bomb. II (1908) 1024; Haines Bot. Bih. and Or. (1924) 957.

Poa interrupta Lamk. Ill. I, 185; Poir. Encycl. V, 87; Heyne ex Roth Nov. Sp. (1821) 67; Koen. ex Roxb. Fl. Ind. I (1832) 335.

Poa Koenigii Kunth Enum. Pl. I (1838) 346.

Eragrostis Koenigii Lank Enum. Hort. Berol. II, 294; Steud. Syn. Pl. Glum. (1855) 265.

- Eragrostis interrupta* Beauv. var. *Koenigii* Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 316; Cooke Fl. Bomb. II (1908) 1024; Haines Bot. Bih. and Or. (1924) 957.
- E. kapalantha* Trin. in Mem. Acad. Petersb. ser. VI, I (1839) 409 (*partim*).
- E. minutiflora* Presl Rel. Haenk. I (1830) 274 (*excl. syn.*); Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 385.
- E. mossulensis* Steud. Syn. Pl. Glum. (1855) 264.
- E. nutans* Nees in Wight Cat. no. 1776, Steud. Nom. ed. II, I (1840) 563, Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 63, t. 76; Lisboa l. c. 381; Bours. Fl. Or. V (1884) 583.
- E. Rothii* Steud. Syn. l. c. 267.
- E. stricta* Steud. l. c. 264.
- E. verticillata* Nees in Wight Cat. no. 1784.
- Poa nutans* Koen. ex Roth l. c. 64; Roxb. Fl. Ind. I (1832) 335 (*non* Retz.).
- P. diarrhena* Schult. Mant. 616.
- Eragrostis diarrhena* Steud. Syn. l. c. 266.
- E. interrupta* var. *diarrhena* Stapf l. c.
- Poa dandira* Roxb. l. c. 336 (*non* Br.).
- Eragrostis dandira* Aitchis. l. c. 169 (*non* Steud.); Duthie Grasses N. W. Ind. 37
- Diplachne elongata* Hochst. ex Steud. l. c. 268.
- Eragrostis diplachnoides* Steud. l. c.
- E. interrupta* var. *diplachnoides* Stapf l. c.
- E. caudata* Nees ex Steud. l. c. 264, Duthie Grasses N. W. Ind. (1883) 37.
- E. japonica* Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 405.
- E. tenella* β, Roem. & Schult. Syst. II (1817) 356.
- E. tenella* Benth. Fl. Hongk. (1861) 431, Fl. Austral. (1878) VIII, 643 (*non* Beauv.); Duthie Fodder Grasses N. Ind. (1888) 65, t. 78.
- E. tenellula* Steud. l. c. 279.
- E. tenuissima* Schrad. ex Nees Fl. Afr. Austr. (1841) 409, 410.
- E. interrupta* var. *tenuissima* Stapf l. c.; Sedgwick & Saxton in Rec. Bot. Surv. Ind. VI, 219, Haines Bot. Bih. and Or. (1924) 958.
- Poa japonica* Thunb. Fl. Jap. (1784) 31.
- P. tenella* R. Br. Prodr. (1810) 181 (*non* Beauv.); Roxb. Fl. Ind. I (1832) 337.
- P. tenellula* Kunth Enum. Pl. I (1838) 338.

We have examined a great number of specimens from all parts of the Presidency. Most of them cannot be classed under any of the 4 varieties mentioned by Stapf. If we wanted to classify them we would have to greatly multiply the number of varieties which could not be satisfactory neither from a theoretical nor practical point of view. Cooke puts the Bombay material under *E. interrupta* var. *Koenigii* Stapf. But then he has seen only one specimen from Surat. We have dropped all the varieties as can be seen from the above synonymy. The following description comprises them all.

Vernacular names : Pohe, Poche, Dhuria, Ghodila, Ghorla, Chuksi, Madra, Shetpatra.

Description : A very variable slender grass from 5-90 cm., annual or perennial. Stems smooth and polished, tufted, geniculate and ascending from the base, branched or not, nodes glabrous. Leaves slender, up to about 25 cm. long, narrow, flat, glabrous; sheaths glabrous, close; ligule a fimbriate membrane.

Panicle exceedingly variable, up to 60 cm. long, either contracted with appressed branches or interrupted with many tiers of rather short spreading subwhorled branches (either long narrow with short dense suberect or erect-patent pseudo-whorls—or long effuse or contracted with solitary or 2-3-nate branches, simple or if branched the whorl rarely overtopped by 1 or 2 branches, ultimate branches not divaricate—or long loose narrow, usually stiff, branches pseudo-whorled, spreading, ramified from the base, branchlets and pedicels divaricate—or long linear-oblong, branches up to 5 cm. long, hardly whorled, simple at the base, etc.). Spikelets usually very minute, from 1-6 mm long, ovate to linear, few to many-flowered. Flowering glumes obtuse, nerves slender, green or pale brown, rarely coloured, keels of palea scaberrulous or smooth. Stamens 2. Grain obovoid.

Locality : Sind : Pad-Idan (Sabnis B513 !); Mirpurkhas, fallow fields (Sabnis B1175 !); Jamesabad (Sabnis B1164 !); Ganga Hill, near Hydrabad (Sabnis B996 !); Bhagar, Indus River (Blatter & McCann D650 !).

Gujarat : In water-holes (Dalzell & Gibson); Dangs, 800 ft., rainfall 100 in. (Sedgwick & Bell 5392 !); Surat (Gammie 16436 !, Woodrow, Cooke); Kabirwad, Broach Dist. (Chibber !); Nadiad (Chibber !); road to Lasandra (Chibber !).

Khandesh : Tapti, Bhusawal N. E. (Blatter & Hallberg 4437 !); Bor, Tapti Isl., sand and mud (Blatter & Hallberg 5475 !); Nim, Tapti, left bank (Blatter & Hallberg

5221 !), Amalner, Boru River (Blatter & Hallberg 4433 !), Muravat, Tapta bank (Blatter & Hallberg 5151 ! 5205 !); Bor (Blatter & Hallberg 5488 !); Chansehi Hill, northern slope (McCann 9986 !); Umalla, Tapta bank (Blatter & Hallberg 5214 !), Toranmal (McCann 9976 ! 9995 !).

Konkan. Tisgaon, near Kalyan (Garade !); Borivli to Kanari Caves (McCann 9989 !); Vehar Lake (McCann 9996 !); Pen (McCann 8556 !), Kase Dohan, Thana Dist. (Ryan 1920 !), Ghatkopar, Horse-shoe Valley (McCann 9994 !), Parel (McCann 5417 !); Sion (McCann 5246 !); Bassem (Lusboa); Thana (Lusboa); Alibag, rocky river-bed (Ezekiel !).

W. Ghats. Khandala, very common in fields (McCann 9998 !), Khandala to Karjat (Blatter & Hallberg 5322 !); Igatpura (Blatter & Hallberg 5193 !), Tangawadi, Igatpuri (Blatter & Hallberg 3834 !), Castle Rock, on banks of a tank (McCann 9993 !).

Deccan. Bhowdan, near Poona (Woodrow); Bahuli, 14 miles N. W. of Poona (Woodrow); Ganeshkhind Botanic Gardens (Gammie !), Trimbak (Chubber !), Dhond, along river (Bhude 1349 !), Barsi River (Gammie 15766 !), Bairawadi, Purandhar (McCann 5056 !); Lohagad (McCann 9987 !); Vaslang, Sholapur (D'Almeida 9980 !).

S. M. Country: Margin of tanks, Yelving, 1,800 ft., rainfall 28 in. (Sedgwick & Bell 3612 !), Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4975 !); Dastkop, 2,500 ft., rainfall 35 in. (Sedgwick 2135 !).

N. Kanara. Halyal, 1,800 ft. (Talbot 2100 !), Kinchola (Talbot 944 !).

Ecology: A subregamous species. Grows in good damp soil near the banks of rivers and streams, in water-holes and borders of rice-fields. The colour of the inflorescence is very variable and also the angle at which the branches spread.

Distribution: India, Ceylon, tropical Asia and Africa.

Economic uses: Eaten by cattle when other food is not to be had. Considered to be a good fodder for buffaloes in Khandesh.

7. ERAGROSTIS UNIOLOIDES Nees.

PLATE 166.

Eragrostis unioloides Nees ex Steud. Syn. Pl. Glum. (1855) 264; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 65, Artchus. Cat. Panjab Pl. (1869) 170; Lusboa in Joura. Bomb. Nat. Hist. Soc. VII (1893) 383; Griseb. in Goett. Nachr. (1868) 76.

Poa unioloides Retz. Obs. V (1786) 19, Roxb. Fl. Ind. I (1832) 339; Kunth Enum. Pl. I (1838) 335; Grah. Cat. Bomb. Pl. (1839) 236.

P. multiflora Roxb. l. c. 338.

P. polymorpha R. Br. Prodr. (1810) 180.

P. rubens Lamk. Ill. I, 184, t. 45, fig. 2; Kunth l. c. 335.

Eragrostis amabilis Wight & Arn. ex Nees in Hook. & Arn. Bot. Beech. Voy. 251 (non Linn.); Nees in Act. Acad. Nat. Cur. XIX. Suppl. I (1843) 205, Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 317; Cooke Fl. Bomb. II (1908) 1025; Haines Bot. Bh. and Or. (1924) 958.

E. polymorpha Trin. ex Steud. Nom. ed. II, I (1840) 364, 562.

E. rubens Hochst. ex Miq. Anal. Bot. II, 26; Steud. Syn. Pl. Glum. (1855) 265.

Briosa rubra Lamk. Ill. I, 187, Kunth l. c. 371.

Umla indica Spreng. Syst. I (1825) 349; Dalz. & Gals. Bomb. Fl. (1861) 298.

Megastachya polymorpha Beauv. Agrost. (1812) 74.

Mr. Hubbard of Kew has helped us with regard to the synonymy of this species. He says in a letter: "The combination *E. amabilis* Wight & Arn. is based on *Poa amabilis* Linn. but the majority of the references, the description and the specimens refer to a different plant which has for a long time been known under this name. It cannot however be called *E. amabilis* Wight & Arn. and the next name for it is *Eragrostis unioloides* Nees (*Poa unioloides* Retz.). The fact that the name *E. amabilis* has been applied to a different species might be used as additional justification for rejecting it."

Vernacular names: Poi, Poke, Mota chava, Chota leniya, Loniya.

Etymology: *Unioloides* means resembling *Umla*.

Description: Annual, glabrous; stem 15-45 cm. long, tufted, slender, erect or geniculate ascending, leafy chiefly at the base; internodes long. Leaves 7-5-15 cm. by 2-5-4 mm., narrowed from a broad subcordate base to an acute tip, smooth; sheaths smooth, glabrous; ligule 0 or obscure.

Panicle oblong or ovoid, 5-10 cm. long, sparingly branched; rachis and nodes glabrous. Spikelets 4-6 mm. long, compressed, ovoid-elliptic or oblong, 20-50-flowered, shortly pedicellate, often purple, rachilla tough, internodes very short. Glumes elegantly distichous, spreading, keeled; involucre glumes subequal or the upper slightly longer than the lower, 1-1.6 mm. long, ovate, acute, 1-nerved; floral glumes broadly ovate or suborbicular, mucronulate, 2 mm.

long, punctulate; palea shorter than its glume and deciduous with it. Stamens 3; anthers minute. Grain obovoid or ellipsoid, laterally compressed, about 0.8 mm. long, orange-brown, smooth.

Locality : *Sind* : Mirpur Sakro (Blatter & McCann D651 !).

Konkan : Pen (Bhide !, McCann !); very common in the Bombay and Salsette Islands (McCann !); Ahigbag (Ezekiel !); Uran (Hallberg & McCann 5130 !); Parel, Bombay Island (Woodrow); Bassein (Woodrow).

W. Ghats : Igatpuri (Blatter & Hallberg 5192 !, McCann !); Khandala, very common (Blatter 4375 ! 5440 !, McCann !); Lonavla (Woodrow 165 !); Panchgani (Blatter 5387 !, Blatter & Hallberg B1243 !); Mahableshwar (Talbot 4511 !); Castle Rock (Gammie 15723 !).

Deccan : Bairawadi, Purandhar (McCann 8739 !); Lohagad, way up (McCann 9504 !); Katraj Ghat (Bhide !); Poona (Woodrow).

S. M. Country : Marshes north of Belgaum (Ritchie 846); Dharwar (Sedgwick 2114 !).

N. Kanara : Karwar, sandy fields by the sea (Sedgwick & Bell 5086 !); Dud-sagar Falls (McCann 9985 !).

Ecology : A sporadic species. A very hardy grass usually growing on foot-paths. Constant treading does not seem to affect its growth very much except that it becomes stunted. Very variable in size and colour of inflorescence. Graham calls it "the most elegant of grasses".

Distribution : India, Ceylon, tropical Asia.

Economic uses : A good grass for horses and cattle.

Explanation of Plate 156 : *Eragrostis unioloides* Nees.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

8. ERAGROSTIS GANGETICA Steud.

Eragrostis gangetica Steud. Syn. Gram. (1855) 266; Trim. Fl. Ceyl. V, 293; Stapf in Dyer Fl. Cap. VII (1900) 617; Prain Beng Pl. 1221; Cooke Fl. Bomb. II (1908) 1025; Haines Bot. Bih. and Or. (1924) 958.

E. elegantula Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 318; Lisboa Bomb. Grasses (1896) 121.

E. Brownei Nees ex Wight Cat. no. 1780 (*partim*); Duthie Grasses N. W. Ind. (1883) 36, Fodder Grasses N. Ind. (1888) 62.

E. luzoniensis Steud. L. c. 266.

Poa charvis Schult. Mant. I, 314.

P. elegantula Kunth Rev. Gram. I (1829) 340.

P. elegans Roxb. Fl. Ind. I (1832) 338.

Vernacular names : Todha, Asara, Chota asara, Kaluargi.

Description : Perennial; stems tufted, 30-90 cm. long, stout, smooth, shining, simple or branched, suberect. Leaves few, 5-20 cm. long, very narrow, convolute, rigid, quite smooth, glaucous, linear, tapering to a fine point; sheaths glabrous except the mouth which is sometimes bearded; ligule a minutely ciliate rim.

Panicle oblong, 5-15 cm. long, nodding; branches solitary, rather distant, often long, suberect or the lower spreading; rachis glabrous; pedicels of spikelets short. Spikelets 4-6 mm. long, linear to linear-oblong, 10-30-flowered; rachilla tough, glabrous, persistent, the internodes short. Lower involucral glume 1.6 mm. long, ovate-oblong, acute, 1-nerved; upper slightly larger, 1-nerved; floral glumes broadly ovate, subacute, reaching to nearly 2.5 mm. long; palea deciduous, slightly shorter than its glume, with scaberulous, keels. Stamens 3; anthers about 1 mm. long, yellow. Grain oblong, about 0.8 mm. long, brown.

"Very similar to *E. stenophylla* in the character of the panicle and the slatey-blue spikelets, but the longer striolate grain is correlated in all the specimens with the longer usually more acuminate glumes and slightly stouter pedicels than occur in *stenophylla*." Haines.

Locality : *Konkan* : Vehar Lake (McCann 5096 !); Campoli (McCann 9409 !).

W. Ghats : Igatpuri (Blatter & Hallberg 5198 !); Khandala (McCann A10 !); Khandala to Karjat (Blatter & Hallberg A3 !); Panchgani (Blatter & Hallberg B1218 ! B1276 !); Vingmala, Mahableshwar, 4,000 ft., rainfall 200 in. (Sedgwick & Bell 4654 !); Londa (Bhide !).

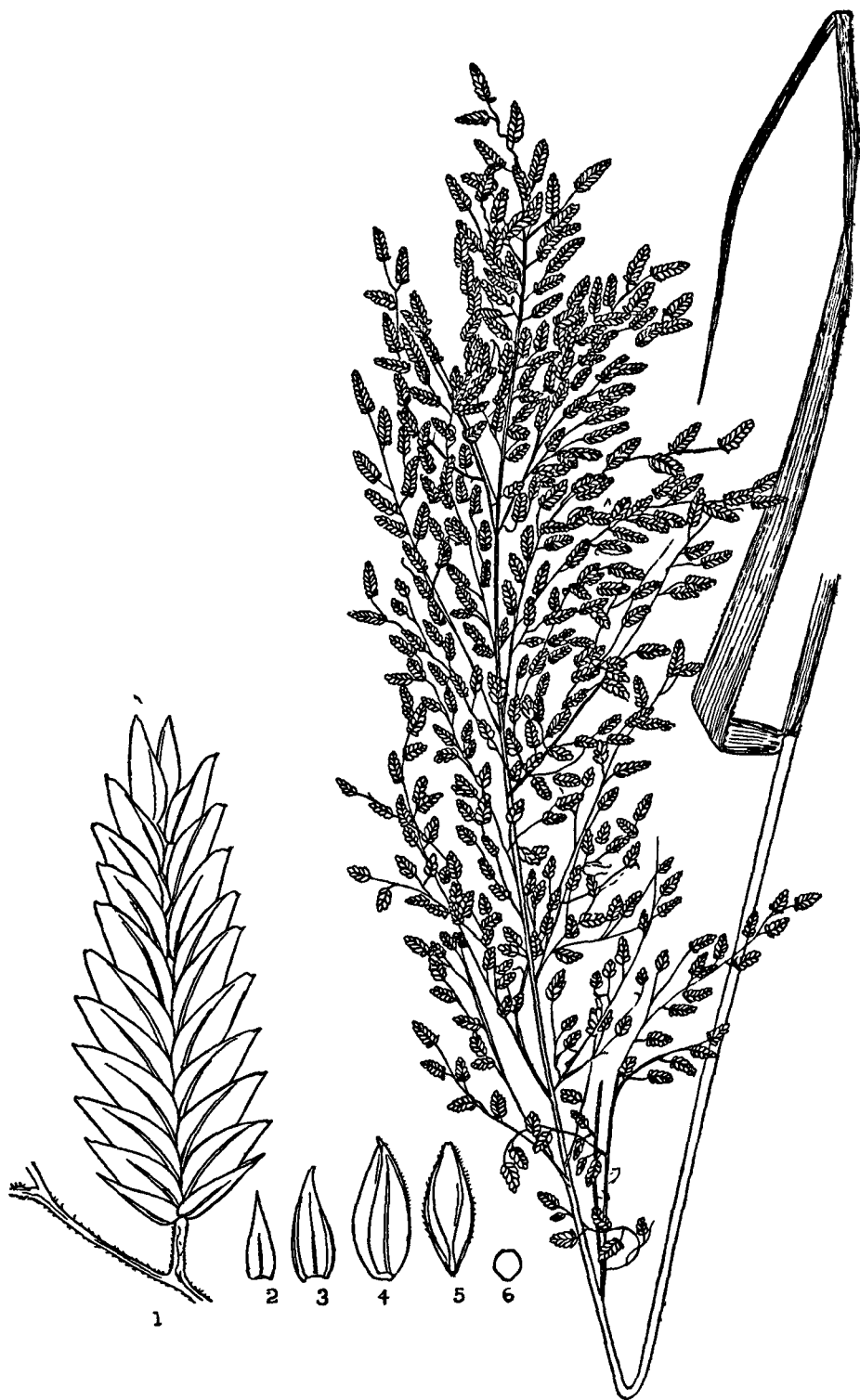
Deccan : Poona, Canal (Ezekiel !); Borkas, Mawal, Poona Dist. (Woodrow).

S. M. Country : Hirdidhal, on the margin of a tank, 2,000 ft., rainfall 30 in. (Sedgwick 3801 !); Havasbhari, edge of a tank, 2,000 ft., rainfall 35 in. (Sedgwick 2110 !); Tadas, tank, 2,500 ft., rainfall 35 in. (Sedgwick 1916 !); Dharwar, ricefield (Talbot 2637 !).



ERAGROSTIS UNIOLOIDES NEES.

Detm. B. K. Bhadr.



ERAGROSTIS CILIARIS (ALL.) LINK.

Detm: B. K. Bhuc

N. Kanara. Karwar (Talbot !); Halyal (Talbot 2381 !); Tinai Ghat (Gammie 15808).

Ecology : A subregarious species. Found in wet ground, very common on margins of tanks.

Distribution : Throughout tropical Asia and tropical Africa.

Economic uses : Eaten by cattle along with other grasses, either fresh or dry.

9. *ERAGROSTIS NUTANS* (Retz.) Nees.

Eragrostis nutans (Retz.) Nees ex Steud. Nom. ed. 2 (1840) 563.

Poa nutans Retz. Obs. IV (1786) 19.

Eragrostis stenophylla Hochst. ex Miq. Anal. Bot. Ind. II (1851) 27; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 385; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 318 (*excl. aliqu.* syn.), Prain Beng. Fl. 1221; Cooke Fl. Bomb. II (1908) 1026; Haines Bot. Bih. and Or. (1924) 959.

E. Brownei Nees in Wight Cat. (1833) no. 1780 (*partim*).

E. elegantula Nees l. c. 1781, α , β (*non* Steud.); Duthie Grasses N. W. Ind. (1883) 37, Fodder Grasses N. Ind. (1888) 63, t. 74.

Vernacular names : Fulha, Chikta, Chumanchara, Chota khidi, Jenkua, Khari.

Etymology : *Stenophylla* means narrow-leaved.

Description : Perennial; stems densely tufted, 30-45 cm. high, erect or geniculately ascending, simple or branched; upper internodes long. Leaves 7.5-12.5 cm. long, very narrow, strict, rather stiff, usually convolute, smooth, quite flat, glabrous, not glaucous; sheaths smooth; ligule a narrow membranous line.

Panicle ovate, or oblong, or sublinear, suberect or nodding, branches rather distant, alternate, obliquely spreading when ripe, much divided upwards; rachis slender, smooth; pedicels of spikelets filiform. Spikelets 4-6 mm. long, linear-oblong, 20-30-flowered; rachilla zig-zag. Lower involucre glume 0.8 mm. long, ovate-oblong, subacute; upper involucre glume slightly longer, both hyaline, 1-nerved; floral glumes broadly ovate, subacute, about 1.6 mm. long, with smooth keels, palea linear-oblong, caducous with the glumes, the keels scabrid. Stamens 3; anthers minute. Grain globose or globosely ellipsoid, 2.5 mm. long, reddish brown, smooth.

Locality : *Khandesh* : Tapti Island, near Bor, on sand and mud (Blatter & Hallberg 5470 !); Umalla, Tapti, on sand (Blatter & Hallberg 5180 !).

Konkan : Uran (Hallberg & McCann 5134 !); Malwan (Woodrow).

W. Ghats : Khandala (McCann 5319 !); Igatpuri (Blatter & Hallberg 5142 !); Panchgani (Blatter & Hallberg B1316 !).

Deccan : Pashan, near Poona (Gammie !); Purandhar (McCann 5601 !); Borkas, Mawal, Poona Dist. (Woodrow).

S. M. Country : Hirbudihal, on the margin of a tank (Sedgwick 2081 !).

N. Kanara : Halyal (Talbot 2165 !); Kulgi (Talbot !).

Ecology : A sporadic grass. Very common in pastures in the Mallad tract of the Carnatic and as a garden weed.

Distribution : India, Ceylon, tropical Asia and Africa.

Economic uses : In Australia the plant is considered to be a good pasture grass.

10. *ERAGROSTIS CILIANENSIS* (All.) Link.

PLATE 167.

Eragrostis cilianensis (All.) Link in Malpighia XVIII (1904) 386.

Poa cilianensis All. Fl. Pedem. II, 246, t. 91, fig. 2.

Eragrostis maior Host Gram. Austr. IV (1809) 14, t. 24; Hook. f. Fl. Brit. Ind. VII (1896) 320; Cooke Fl. Bomb. II (1908) 1026; Haines Bot. Bih. and Or. (1924) 959.

E. flexuosa Steud. Syn. Pl. Glum. (1855) 266; Duthie Grasses N. W. Ind. (1883) 37.

E. megastachya Link Enum. Hort. Berol. I (1827) 187; Kunth Enum. Pl. I (1838) 333; Reichenb. Ic. Fl. Germ. t. 91; Artchis. Cat. Panjab Pl. (1869) 169; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 63, t. 75; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 382; Boiss. Fl. Or. V (1884) 580.

E. multiflora Aschers. ex Boiss. l. c.

Poa multiflora Forsk. Fl. Aeg.-Arab. (1775) LXI, no. 58, CIV, no. 69, p. 21.

Eragrostis paeoides Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 404.

E. vulgaris var. *megastachya* Coss. et Dur. Fl. Alger. 148.

Poa cilianensis All. Fl. Pedem. II, 246, t. 91, fig. 2.

P. flexuosa Roxb. Fl. Ind. I (1832) 339.

P. Roxburghiana Schult. Mant. II, 315.

P. tortuosa Spreng. Syst. Veg. I (1825) 345.

Briza Eragrostis Linn. Sp. Pl. (1753) 70; Schreb. Besch. Græs. II, 74.

Poa Eragrostis Cav. Ic. I (1791) 63, t. 92; Sibth. Fl. Græc. t. 73.

Megastachya Eragrostis Beauv. Agrost. (1812) 74.

Briza oblonga Moench Meth. (1802) 185.

Vernacular names : Ran pohe, Pohe, Kaodia.

Description : Annual; stems 30-90 cm. high, usually stout and branched, leafy, erect or geniculately ascending, smooth, polished. Leaves reaching 20 cm. by 8 mm., narrowed to a fine point, flat, smooth, flaccid, glandular along the margins; sheaths sparingly bearded; ligule a ciliate ridge.

Panicle 5-20 cm. long, erect, oblong or ovate-oblong, open or sometimes contracted, usually stiff; rachis strict, rather stout, smooth; branches spreading or suberect, capillary, stiff or flexuous, again branching from the near base, the branchlets short, capillary. Spikelets longer than their pedicels, usually crowded, ovate and 4-6 mm. long with 6-8 glumes, to linear-oblong rather narrowed upwards, and 8.5-13 mm. long or more with many (up to 60) glumes, olive-grey or yellowish; rachilla tough, zigzag, the internodes short, smooth. Involucral glumes ovate, acute, with scabrid keels; lower smaller than the upper, 1- (sometimes 3-) nerved; upper slightly larger than the lower, 3-nerved; floral glumes broadly ovate, acute, sometimes apiculate, 2 mm. long, strongly nerved; palea obovate, much curved, shorter than its glume, with ciliate keels. Stamens 3, anthers 0.4 mm. long. Grain globose, 0.6 mm. diam., microscopically rugulose, reddish brown.

Locality : *Sind*. Sanghar (Sabnis B753 f B897 !); Mirpurkhas, on bank of dry water-course (Sabnis B1024 !).

Kathawar : Morvi (Woodrow).

Gujarat : Kairwad, Broach (Gammie !).

Khandesh : Chanseli, N. slope (McCann A14 !); Nim, Tapti bank (Blatter & Hallberg 5109 !); Umalla, Tapti sand (Blatter & Hallberg 5177 !); Bor, Tapti sand (Blatter & Hallberg 5187 !).

Konkan : Mahalaxmi, Clerk Road, along brackish water (Sabnis A13 !).

W. Ghats : Khandala, road (Blatter 5445 !).

Deccan : Kannala, Sholapur Dist. (Mamlatdar of Kannala !); Purandhar (McCann 5039 !); Kirkee (Gammie 896 !); Poona (Jacquemont 349, Woodrow), Agricultural College Farm (Ezekiel !).

S. M. Country : Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 2834 !); Badami (Woodrow).

N. Kanara : Halyal (Talbot 2159 !).

Distribution : India, Ceylon, westward to the Mediterranean, tropical and subtropical Asia.

Economic uses : Not used as fodder in this Presidency. Duthie says that it is used more or less as fodder.

Explanation of Plate 157 : *Eragrostis cilianensis* (All.) Link.

1. Spikelet with part of rachis.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

11. ERAGROSTIS MINOR Host.

PLATE 158.

Eragrostis minor Host Gram. Austr. IV (1809) 15 (*in nota*) & in Fl. Austr. I (1827) 135; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 321; Cooke Fl. Bomb. II (1908) 1027; Haines Bot. Bh. and Or. (1924) 960.

E. poaeiformis Link Hort. Berol. I (1827) 188; Reichenb. Ic. Fl. Germ. t. 91

E. poaeoides Beauv. Agrost. (1812) 76; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 65, Aitchison Cat. Panjab Pl. (1869) 170; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 387; Boiss. Fl. Or. V (1884) 580.

E. poaeoides β , Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 404.

Poa Eragrostis Linn. Sp. Pl. (1753) 68 (*partim* !); Kunth Enum. Pl. I, 332; Schreb. Besch. Græs. II, t. 38; Host Gram. Austr. II, 50, t. 69.

Briza Eragrostis Vill. Fl. Delph. II, 50 (*non* Linn.).

Vernacular name : Sul.



ERAGROSTIS MINOR HOST

Desm R K Bude



ERAGROSTIS TREMULA HOCHST

Delin: B. K.

Description : Annual, stems 15-45 cm. high, densely tufted, slender. Leaves 3-8-15 cm. by 2-5-8 mm., linear, acute, usually glandular along the margins, flat; sheaths shortly bearded at the mouth; ligule a pubescent ridge.

Panicle oblong or ovate, rather stiff, 5-15 cm. long, rachis glabrous, branches spreading when mature. Spikelets linear to ovate, 6 by 1-2 mm., up to 12-flowered, pale green to purplish or olive-grey; pedicels shorter than the spikelets, except the terminal ones; rachilla tough. Involucral glumes subequal or the upper slightly larger, about 1-2 mm. long, ovate, acute, 1-nerved; floral glumes about 1-6 mm. long, ovate, acute, strongly nerved; palea obovate-oblong, about 1 mm. long, shorter than the persistent glumes, the keels scabrid or slightly ciliate. Stamens 3; anthers about 0-25 mm. long. Grain 0-5 mm. long or more, dorsally rounded or slightly flattened.

Locality : *Sind* Jamesabad, in fields (Sabnis B1111!), Pad-Idan (Sabnis B510!); Larkana (Sabnis B476!), Sanghar (Sabnis B751! B752!).

Gujarat Godra (Woodrow), Panch Mahals (Woodrow).

Khandesh Umalla, Tapti sand (Blatter & Hallberg 5180!); Tapti Island near Bor, on sand and mud (Blatter & Hallberg 4449! 5470!), Manmad, Redmond's garden (Blatter A12!), Tapti, Bhusawal, N. E. (Hallberg 5112!).

Konkan : Parel (McCann 5376!), Bombay (Lambert).

W. Ghats Tangawadi, Igatpuri (Blatter & Hallberg 5835!).

Deccan . Purandhar (McCann 5601!); Bhimthadi, Poona Dist. (Mamlatdar of Bhimthadi!); Man, Satara Dist. (Mamlatdar of Man!); Poona (Jacquemont 350), Chatter-shinji Hill (Ezekiel!); Nasik (Lisboa).

S. M. Country . Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4487!); Gokak Hills (Shevade!).

Ecology : Common at Dharwar as a garden weed. At Nasik "it grows in khar lands and has to be weeded out, or it destroys the rice plant." (Lisboa.)

Distribution : India, Afghanistan, tropical Africa.

Economic uses : Not known from the Presidency.

Explanation of Plate 158 : *Eragrostis minor* Host.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

12 ERAGROSTIS TREMULA Hochst.

PLATE 159.

Eragrostis tremula Hochst in Schump. Pl. Abyss. no. 6, in Flora (1842) I Beibl, 134, Duthie Fodder Grasses N. Ind. (1883) 65, t. 79, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 382; Boiss Fl. Or. V (1884) 581, Prain Beng Pl 1221, Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 320, Cooke Fl. Bomb. II (1908) 1027; Haines Bot. Bih. and Or. (1924) 960.

Poa tremula Lamk. III. I, 185.

Eragrostis multiflora Trin in Mem Acad. Petersb. ser VI, I (1841) 401, Dalz & Gibs. Bomb. Fl. (1861) 298, Duthie Grasses N. W. Ind. (1883) 38; Arctch. Cat. Panjab Pl. (1869) 169.

Poa multiflora Roxb Fl. Ind. I (1832) 338 (non Forsk.).

Eragrostis rhachitricha Hochst ex Miq Anal. Bot. Ind. pt. II (1851) 25; Watt Diet. Econ. Prod. III, 256.

Vernacular names : Chiraka, Chirka ket, Chirka chauvalia.

Etymology : *Tremula* means trembling. The very slender pedicels which support the long spikelets, give rise to the constant tremulous motion shown by this species.

Description : Annual, stems densely tufted, suberect, 15-60 cm. long. Leaves 5-12-5 cm. by 2-4 mm., linear-lanceolate, tapering to a fine point; sheaths bearded at the mouth; ligule minutely hairy line.

Panicle large, ovate, very diffuse, branches solitary, filiform, pedicels very slender, from $\frac{1}{2}$ the length of the spikelets to longer than them, rachis glabrous or bearded at the nodes. Spikelets 2-5 cm. or more long, linear, narrower upwards, from 10-60-flowered. Involucral glumes subequal, 1-2-1-6 mm. long, subobtuse, thin, 1-nerved; rachilla tough, glabrous; floral glumes closely set, broadly ovate, subobtuse, 1-6-2 mm. long, with strong nerves; palea obovate-oblong, slightly shorter than its glume, persistent, with scabrid keels. Stamens 3; anthers minute. Grain scarcely 0-5 mm. diam. globose or nearly so.

Locality : *Cutch :* Sumrasar (Blatter !).

Kathawar : Gogo (Dalzell & Gibson, Woodrow).

Gujarat : Sevaha (Chibber !); Perim Island, Gulf of Cambay (Blatter !).

W. Ghats : Lonavla (Lisboa); Londa, on a rock in the river-bed (Bhide !).

S. M. Country : Gadag (Bhide !).

Ecology : A subgregarious species. It is a sand plant, very common in Gujarat sand. Reappears on sand in the estuary of the Kala Nuddi of N. Kanara. According to Roxburgh it is found on dry elevated places.

Distribution : India, Afghanistan, tropical Africa.

Economic uses : Considered to be a good fodder at Ajmere. Not used in the Presidency. The grain has been used at famine times in the Punjab.

Explanation of Plate 159 : *Eragrostis tremula* Hochst.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

13. *ERAGROSTIS TENUIFOLIA* Hochst.

Eragrostis tenuifolia Hochst in Flora 24 (1841) I. Intelligenz. 20 (*nomen nudum*); Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 322; Cooke Fl. Bomb. II (1908) 1027; Prain Beng. Fl. 1221.

Poa tenuifolia A. Rich. Tent. Fl. Abyss. II (1851) 425.

E. collocarpa K. Schum. in Engler's Pflanzenw. Deutsch.—Ost Afr. C. 114.

E. parviglumis Hochst. ex Steud. Syn. Pl. Glum. (1855) 268.

Etymology : *Tenuifolia* means narrow-leaved.

Description : Perennial; stem 60-90 cm. high, erect, slender, branched. Leaves long, very narrow; mouth of sheath naked.

Panicle 7.5-15 cm long, oblong to ovate, very open; rachis glabrous; branches solitary or 2-nate, distant. Spikelets 6 mm. long or less, linear, 5-15-flowered. Involucral glumes very unequal; lower minute, hyaline; upper remote from and larger than the lower, about 0.8 mm. long, ovate, subacute, usually nerveless, floral glumes 2 mm. long, ovate, subacute or apiculate; palea shorter than its glume, strongly curved, persistent, with scabrid keels. Stamens 3; anthers 1 mm long. Grain 2 mm long, obovoid-oblong, slightly compressed, dorsally grooved.

Locality : *W. Ghats.* Panchgam (Blatter & Hallberg B1313 | B1317 !).

S. M. Country : Belgaum (Ritchie).

N. Kanara Dandeli, 1,800 ft., rainfall 100 in. (Sedgwick & Bell 4206 !).

Distribution : W. Peninsula, tropical Africa.

14. *ERAGROSTIS PAPPOSA* Steud.

Eragrostis papposa Steud. Nom. ed. II, I (1840) 564; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 322.

Poa papposa Desf. in Roem. & Schult. Syst. II (1817) 585.

P. nigra Clem. ex Willk. & Lange Prodr. Fl. Hisp. I, 83.

Eragrostis atro-virens Lange in Koebj Vedensk. Meddel. (1860) (*non* Desf.).

E. rigidifolia Hochst. Herb. Mem. Div. Forsk. (*nomen*).

E. speirostachya Coss. et Dur. ex Lange l. c.

E. vulgaris var. *speirostachya* Coss. et Dur. Fl. Alger. 148

E. verticillata Coss. ex Lange l. c. (*non* Cav.).

Etymology : *Papposa* means having a pappus, alluding to the mouth of the leaf-sheath which is bearded with long silky hairs.

Description : An elegant perennial. Stems 30-50 cm. high, very slender, simple. Leaves short, strict, very narrow, convolute; mouth of sheath bearded with long silky hairs.

Panicle 10-20 cm long, ovoid, very delicate, lax, open, sparingly branched; rachis filiform, glabrous; branches solitary, alternate, rarely binate, spreading, almost capillary, naked below, loosely branched beyond the middle with capillary, spreading, stiff branchlets; pedicels long, capillary. Spikelets 4-8 mm. long, linear, 7-23-flowered, very pale yellow or dark or pale olive-grey; rachilla tough. Involucral glumes subequal or lower shorter, hyaline; lower involucral glume 1 mm. long, usually less, nerveless, upper slightly longer, faintly 1-nerved. Flowering glumes broadly ovate, margins above hyaline, about 1.5 mm. long; palea rather

shorter, obtuse, denticulate, persistent, keels scabrid Stamens 3, anthers 0.25 mm. long. Grain obovoid, about 0.5 mm. long, dorsally grooved

Locality : *Sind* (ex Agharkar).

Distribution : Punjab, Trans-Indus districts, westward to Arabia, N. Africa, Spain.

15. *ERAGROSTIS PILOSA* Beauv

PLATE 160

Eragrostis pilosa Beauv Agrost (1812) 71, Reichb. Ic. Fl. Germ. t. 91, Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 64, Aitchis Cat. Panjab Pl. (1869) 170, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 381, Boiss. Fl. Or. V (1884) 581; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 323; Cooke Fl. Bomb. II (1908) 1028; Haines Bot. Bih. and Or. (1924) 960

Poa pilosa Linn. Sp. Pl. (1753) 68, Host Gram. Austr. II, 168, t. 68.

Eragrostis indica Steud. Syn. Pl. Glum. (1855) 264

E. parviflora Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 411.

E. pellucida Steud. l. c. 279

E. punctata Link. ex Steud. Nom. ed. II, I (1840) 561, Syn. Pl. Glum. (1855) 264.

E. verticillata Roem. & Schult. Syst. II (1817) 575; Reichb. Ic. Fl. Germ. t. 9; Aitchis. Cat. Panjab Pl. (1869) 170.

Poa indica Koen. ex Rottl. in Ges. Naturf. Fr. Berl. Neue Schrift IV (1803) 194.

P. parviflora et pellucida R. Br. Prodr. (1810) 180

P. punctata Linn. f. Suppl. (1781) 109, Kunth Enum. Pl. I (1838) 330; Roxb. Fl. Ind. I (1832) 338

P. verticillata Cav. Ic. I, 63, t. 93, Kunth Enum. Pl. I (1838) 329

Vernacular names : Burwai, Chiraka-dana, Kutaki

Description : Annual, stems 15-60 cm. high, tufted, erect or geniculate ascending, slender, flaccid. Leaves usually short and narrow (rarely elongate), generally convolute; sheaths appressed, glabrous, bearded at the mouth, ligule a softly hairy ridge

Panicle 5-15 cm. long, erect or inclined, oblong to pyramidal, open or contracted, rachis glabrous or hairy, filiform, branches fascicled or whorled, capillary, much divided. Spikelets scattered (not fascicled), 3-2.5 by 0.8-1.2 mm., linear, 5-12-flowered, often purplish, pedicels longer or shorter than the spikelets, rachilla tough, smooth, flexuous. Glumes all hyaline involucre glumes very unequal, lower ovate, nerveless, upper much larger, ovate-lanceolate, acuminate, 1-nerved, floral glumes 1.6-2.5 mm. long; palea subpersistent, the keels scabrous or nearly smooth. Grain ellipsoid, 1.4-1.7 mm. long, laterally apiculate at the base.

Locality : *Sind*. Sanghar (Sabnis B902 !)

Konkan : Byculia, common in Bombay Isl. (McCann A8 !); Karjat (Hallberg 3602 !), Kalyan (Garade !)

W. Ghats : Igatpuri (McCann 4590 !), Khandala (McCann A7 !).

Deccan : Lina Hill, Nasik Dist. (Blatter & Hallberg 9975 !), Nasik (Lisboa); Deolali (Blatter & Hallberg 4559 !), Gangapur (Blatter & Hallberg 4678 !), Waghote, Mawal, Poona Dist. (Woodrow), Poona (Cooke), Chattarshimji (Ezekiel !), Ganeshkhind Bot. Gardens (Supt. of the Gardens !), Bairawadi, Purandhar (McCann 5068 !)

S. M. Country : Dharwar (Sedgwick 2672 !, Woodrow)

Ecology : A sporadic grass. Grows usually in damp and swampy ground.

Distribution : Most warm countries.

Economic uses : Considered to be a good fodder. Liked by buffaloes.

Explanation of Plate 160 : *Eragrostis pilosa* Beauv.

1. Spikelet.
2. Lower invol. glume
3. Upper invol. glume
4. Floral glume.
5. Palea.
6. Grain, stamens and style.

16. *ERAGROSTIS BIFARIA* Wight.

Eragrostis bifaria Wight ex Steud. Nom. ed. 2, I (1840) 562, Syn. Pl. Glum. (1855) 264, Suppl. 282, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 387, Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 325, Cooke Fl. Bomb. II (1908) 1029.

Poa bifaria Vahl Symb. II, 19, Roxb. Fl. Ind. I (1832) 331; Kunth Rev. Gram. I (1829) 334, t. 80, Enum. Pl. I (1838) 327, Suppl. 282.

Vernacular names : Chiraka, Punya-sufed, Chota blankta, Mol.

Description : Perennial; stems 30-90 cm. high, densely tufted, erect, simple, subcompressed, glabrous, clothed at the base with the soft fibres of old sheaths. Leaves 5-10 cm. long, narrow, linear, acute, rigid, smooth; sheaths glabrous, keeled; ligule a pubescent line. Spikelets secund, distichously spreading in a long simple terminal spike 25-30 cm. long. Spikelets ovoid to oblong, 15-20-flowered, 6-8.5 mm. long (rarely linear, reaching 1.7 cm. long and up to 40-flowered), laterally compressed, olive-grey or green. Involucral glumes strongly 1-nerved and keeled; lower involucral glume 4 mm. long, acutely acuminate, with scabrous keel; upper involucral glume 2 mm. long, with stout rounded keel; floral glumes broadly ovate, subacute, 3.2 mm. long; palea slightly shorter than its glume, with winged keels, the wings 0.25 mm wide, ciliate. Stamens 3; anthers 1 mm. long.

Locality : *Konkan* : Bassein (Chibber !); Parsik, hill (Ryan 1147 !); Wada range, Thana Dist. (Ryan 687 !).

W. Ghats : Matheran (Gammie 16649 !); Khandala (Woodrow).

Deccan : Sinhagad, forests (Blude !); Kirkee (Garade 479 !); Chhattarshinji Hill, Poona (Ezekiel !).

S. M. Country : Between Yelvigi and Savanur, dry hillside, 1,800 ft. (Sedgwick 2019 !); Hubli, dry hillsides, 2,000 ft., rainfall 28 in. (Sedgwick & Bell 4915 !); Badami (Talbot 2927 !); Haven (Talbot 2179 !); Belgaum (Ritchie).

Ecology : Grows in sandy and rocky ground.

Distribution : W. Peninsula, tropical Africa.

Economic uses : A good fodder grass.

17. *ERAGROSTIS BRACHYPHYLLA* Stapf.

Eragrostis brachyphylla Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 327; Haines Bot. Bih. and Or. (1924) 961.

Etymology : *Brachyphylla* means short-leaved.

Description : Perennial. Stem erect, slender, 25-45 cm. high, from a tuft of old fibrous leaf-sheaths. Leaves nearly all radical, 5-10 cm. long, 2-5 mm. broad, coriaceous, linear, flat or conduplicate, obtuse or subacute, glabrous above.

Spikes 7-20 cm. long, slender. Spikelets 6-18 mm. long, close set, linear or linear-oblong, secund, 2-seriate, slightly compressed, olive-green, about 20-flowered, lenticular in section. Glumes closely imbricate, involucral ones subequal, up to 2 mm. long, lower one acute, acutely keeled, upper obtuse, dorsally rounded. Flowering glumes up to 2.5 mm. long, rather turgidly broadly ovate (when unfolded) with rounded tip or obtuse, lateral nerves very weak, midrib microscopically scabrid. Palea as large, somewhat obovate, concave towards rhachilla, keels scabrid, narrow. Grain very small, shortly ellipsoid, obscurely trigonous, epicarp coarsely reticulate.

Locality : *Gujarat* : Sevalia (Chibber !).

S. M. Country : Badami Fort (Blude !).

Distribution : Bihar, Central Provinces, W. Peninsula.

82. *HALOPYRUM* Stapf.

A tall stout perennial glabrous grass with a branching creeping sheathed rootstock. Leaves narrow, rigid, convolute.

Spikelets large, many-flowered, sessile or shortly pedicellate on the short alternate branches of an elongate panicle, ovoid, strongly laterally compressed, not jointed on their pedicels, nor are the pedicels jointed on their branches, rhachilla articulate at the base and between the flowering glumes, silky hairy. Glumes many, closely distichously imbricate, dorsally rounded, coriaceous, keeled, involucral glumes subequal, ovate-lanceolate, acuminate or apiculate; lower involucral glume 1-3-nerved; upper involucral glume 5-nerved; floral glumes 6-10, rather shorter than the involucral, mucronulate, 3-nerved; palea as long as the glume, subacute, 2-keeled. Lodicules 2, obcordate. Stamens 3. Styles short, free; stigmas elongate. Grain ellipsoid, compressed, deeply hollowed antically, free.

Species 1.—Coasts of India and Ceylon, Arabia, E. Africa.

1. *HALOPYRUM MUCRONATUM* Stapf.

PLATE 161.

Halopyrum mucronatum Stapf in Hook. Ic. Pl. t. 2448; Hook. f. Fl. Brit. Ind. VII (1896) 328; Cooke Fl. Bomb. II (1908) 1029.

Brizopyrum mucronatum Nees in Wall. Cat. no. 8898.

Desmazeria umoloides Desf. Voy. Yemen 220.



ERAGROSTIS PILOSA BEAUV.



HALOPYRUM MUCRONATUM STAPF.

Delin: B. K.

Eragrostis mucronata Trim. Cat. Ceyl. Pl. 109 (non Roem. & Schult.).

Triticum repens Thw. Enum. Pl. Zeyl. 376.

Aeluropus Aitchis. Cat. Panjab Pl. (1869) 169.

Eragrostis sp. Sect. *Sclerostachya* Benth. in Gen. Pl. III, 1187.

Etymology : *Halopyrum* is derived from *hals*, *halos*, the sea, and *pyros*, wheat, corn, alluding to the halophytic habit of the grass.

Description : Rootstock sending up hard woody stems 30-45 cm. high and as thick as a crow-quill, smooth, shining, with strict vermiform roots, the branches often fasciated and clothed at the base with pale coriaceous shining mucronate sheaths. Leaves 20-30 cm. by 3-4 mm., convolute (rarely flat), very narrow, glaucous, coriaceous, striate, quite smooth; sheaths terete, appressed, striate, hard with villous mouth, ligule a few hairs.

Panicle 30-40 cm. long, erect or nodding; rachis and branches quite smooth, angular, wavy. Spikelets 13-16 mm. long, flat, sessile or shortly pedicellate, 10-15-flowered, smooth, white or pale yellowish; rachilla very short, the hairs half as long as the glumes. Lower involucre glume 6 mm. long, scarcely longer than the lowest flowering glume, ovate-lanceolate, apiculate; upper involucre glume 8-5 mm. long, strongly 5-nerved.

Locality : Sind : Clifton, near Karachi (Sabnis B796 l); Manora Island, Karachi Harbour (Sabnis B832 l).

Kathnawar : Porbandar (Bhude l, Bhiva).

Ecology : This grass is a halophyte.

Distribution : Of the genus.

Explanation of Plate 161 : *Halopyrum mucronatum* Staf.

1. Spikelet
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain and lodicules.

83. *LEPTOCHLOA* Beauv.

Annual grasses. Leaves flat or involute. Spikelets very minute, compressed, 1-many-flowered, sessile or shortly pedicelled, alternate and unilaterally 2-seriate on the very slender spiciform branches of a lax panicle, sessile or minutely pedicelled, not jointed at the base; rachilla jointed at the base and beneath each glume, produced between each glume and often beyond the terminal. Glumes usually 2- (sometimes 1-) many-flowering, membranous. Involucral glumes subequal or unequal, oblong, lanceolate or almost linear-lanceolate, 1-nerved; lower and other flowering glumes ovate when unfolded, subacute or obtuse, 3-nerved, 1 nerve in the keel and usually 1 near each margin, nerves usually hairy; palea shorter, 2-nerved. Lodicules 2, cuneate. Anthers 3, short. Styles free. Grain subglobose, oblong, obovoid or 3-gonous, closely invested by the glume or palea.

Hitchcock unites *Dyplachne* with this genus.

Species probably 15.—In the warmer regions.

This genus is not represented in Cooke's Flora.

- | | |
|--|--------------------------|
| 1. Slender plant, spikes 5-7.5 cm. long, spikelets 2-3-flowered | 1. <i>L. contracta</i> . |
| 2. More robust plant, spikes 5-10 cm. long, spikelets 4-6-flowered | 2. <i>L. chinensis</i> . |

1. *LEPTOCHLOA CONTRACTA* Blatter & McCann, nov. comb

Poa contracta Retz. Obs. III (1783) 11.

P. panicca Retz l. c.

P. malabarica Klein ex Steud. Nom. ed. 2 (1840) 303, 60.

P. virgata Roth Nov. Sp. (1821) 66.

Awa filiformis Roxb. Fl. Ind. I (1832) 326.

Cynodon Neesii Thw. Enum. Ceyl. Pl. 371.

C. polystachyus R. Br. Prodr. (1810) 187.

C. virgatus Nees ex Wall. Cat. No. 8894; Steud. Syn. Pl. Glum. (1855) 213.

Leptochloa polystachya Benth. Fl. Austr. VII (1878) 617 (non Kunth.); Ridley Fl. Malay Pen.

V (1925) 248; Hook. f. Fl. Brit. Ind. VII (1896) 298.

L. Neesii Benth. in Journ. Linn. Soc. XIX (1881) 108.

L. filiformis Roem. & Schult. Syst. II (1817) 580 ; Duthie Grasses N. W. Ind. (1883) 192 ; Hook. f. l. c.

Eragrostis chinensis Duthie Fodder Grasses N. Ind. (1888) 59, t. 71.

Etymology : *Leptochloa* is derived from *leptos*, slender, and *chloa*, grass.—*Contracta* means contracted, alluding to the panicle which is sometimes contracted.

Description : A very slender grass, 30-90 cm. high. Stems tufted and geniculate ascending. Leaves flat, flaccid, 10-25 cm. long, finely acuminate, sometimes sparsely hairy on the nerves and on the sheaths ; ligule short, erose or setosely lacerate.

Panicle 10-25 cm. long, contracted or diffuse. Spikes 1-7.5 cm. long, exceedingly filiform with 2-nerved rachis. Spikelets about 1 mm. long, 2-3-flowered, distant nearly their own length on the rachis on very short pedicels. Involucral glumes linear- or oblong-lanceolate. Flowering glumes 2-3, broadly ovate, rather shorter than the upper involucral glumes, with median nerve and submarginal nerves microscopically hairy ; palea rather shorter, reduplicate. Grain fusiform-oblong, deeply grooved on one side, pericarp adherent, but slightly produced each end.

Locality : *Gujarat* : Surat, near Athwa Farm (Bhude !); Ahmedabad, in garden (Sedgwick !).

Konkan : Parel, Bombay Isl (Talbot !); Victoria Gardens, Bombay Isl. (McCann 5351 ' 5568 !); Byculia, Bombay Isl. (McCann 440 !).

Ecology : A weed in cultivated ground.

Distribution : Throughout India and Burma, Ceylon, tropical Asia, Africa and America.

2. LEPTOCHLOA CHINENSIS Nees.

Leptochloa chinensis Nees in Syll. Ratissb. I (1824) 4, Agrost. Bras. 432 ; Benth. Fl. Hongk. (1861) 430, Fl. Austral. VII (1878) 617 ; Duthie Grasses N. W. Ind. (1883) 35 (*excl. syn.*), Fodder Grasses N. Ind. (1888) 59, t. 71, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 372 (*excl. syn. tenerrima*), Hook. f. Fl. Brit. Ind. VII (1896) 299 ; Haines Bot. Bih. and Or. (1924) 972

Poa chinensis Linn. Sp. Pl. (1753) 69 (*excl. syn. Burm.*), Roxb. Fl. Ind. I (1832) 332.

P. malabarica Retz. Obs. V, (1786) 19.

P. aethiops Roem. & Schult. Syst. II (1817) 574

P. decipiens R. Br. Prodr. (1810) 181.

Vernacular names : Chenhel, Jhura, Phulkia.

Description : Stem tall, stout, 60-120 cm. high, erect or geniculate ascending. Leaves 15-45 cm. long, flat or convolute, scaberulous ; sheaths loose, ligule short, lacerate.

Panicle 15-25 cm. long. Branches numerous, slender, ample, opposite or alternate, sub-erect or spreading, 5-10 cm. long. Spikelets 4-6-flowered, about 2.5 mm. long, alternate, short-pedicelled, distant or approximated, narrow. Involucral glumes somewhat unequal, lanceolate, acute or subulate. Flowering glumes broader, lower apiculate with pilose nerves ; nerves of palea pilose. Grain loose, obtusely trigonous, subrugose.

Locality : *Gujarat* (*ex* Lisboa).

Konkan : Parel, Bombay Isl (*ex* Lisboa).

S. M. Country : Kilgerry Tank (Talbot !)

Ecology : Grows on the borders of watercourses and places with much moisture.

Distribution : Throughout India and Burma, Ceylon, Malaya, China, Japan, Australia.

Economic uses : Cattle eat the grass.

84. DESMOSTACHYA Stapf.

(*Eragrostis* Beauv. *partim*).

This genus agrees with *Eragrostis* Beauv., except in the following points : Spikelets very closely packed, imbricate, laterally very much compressed, secund, sessile and articulate on the very short densely crowded branchlets of a tall narrow racemiform panicle, acute and deciduous ; rachilla subarticulate.

Species 1.—India to Syria and N. Africa.

1. DESMOSTACHYA BIPINNATA Stapf.

PLATE 162.

Desmostachya bipinnata Stapf in Fl. Cap. VII, 632.

Briza bipinnata Linn. Syst. Nat. ed. X (1759) 875.

Uniola bipinnata Linn. Sp. Pl. ed. II. 104.



DESMOSTACHYA BIPINNATA STAPF.

Delin B K Bhide.



DIPLACHNE FUSCA BEAUV

- Leptochloa bipinnata* Hochst. in Flora XXXVIII (1855) 422
Eragrostis cynosuroides Beauv. Agrost. (1812) 71, 162, Steud. Syn. Pl. Glum. (1855) 264; Wight Cat no. 1774, 1774b; Trin in Mem Acad. Petersb ser VI, I (1831) 415; Dalz. & Gibs. Bomb. Fl (1861) 298, Arctus. Cat. Panjab Pl. (1869) 169; Duthie Grasses N W, Ind (1883) 37, Fodder Grasses N Ind (1888) 62, t 40, Boiss. Fl Or V (1884) 583; Lisboa in Journ. Bomb. Nat. Hist Soc VII (1893) 387; Hook f Fl Brit Ind. VII (1896) 324, Cooke Fl Bomb II (1908) 1028; Prain Beng. Pl. 1221.
Poa cynosuroides Retz Obs Fasc. IV (1786) 20, Roxb. Fl Ind I (1832) 333, Del Fl d'Egypte 159, t 10, Grah. Cat. Bomb. Pl (1839) 236, Kunth Enum. Pl. I (1838) 227.
Desmostachya cynosuroides Stapf in Haines Bot Bih. and Or (1924) 962; Blatter, McCann & Sabnis in Journ. Ind. Bot VI (1927) 76
Cynosurus durus Forsk Fl Aegypt-Arab. (1775) 71

Vernacular names : Darbha, Dab, Dhab, Dib, Kussa, Koosha, Drab, Dabvi, Durper.

Description : Perennial, tall, branched from the base; rootstock stout, creeping; stolons very stout, covered with shining sheaths, stems 30-90 cm high, tufted, smooth, erect, stout. Leaves many, the basal fascioled, reaching sometimes 50 cm. long and 10 mm broad at the base, rigid, acuminate, with filiform tips and hispid margins, sheaths glabrous, ligule a hairy line.

Panicle 15-45 by 1.3-3.8 cm, strict, erect, narrowly pyramidal or columnar, often interrupted, rachis puberulous, branches many, short, scarcely reaching 2.5 cm long, crowded, clothed from the base with sessile imbricating spikelets. Spikelets sessile, secund, 2-seriate and crowded, deflexed, pale brown, rather shining, 13 mm long, up to 30-flowered, rachilla tough. Involucral glumes very unequal, lower 0.5 mm long, upper 1.6 mm long, obtuse; floral glumes 1.5-2 mm long, ovate, acute, coriaceous, palea shorter than its glume, subcoriaceous, with minutely scabrid keels. Stamens 3, anthers 0.8 mm. long. Grain 0.5-0.6 mm long, obliquely ovoid, laterally compressed, obscurely 3-gonous.

Locality : Sind Jacobabad (Bhide !), Hyderabad (Bhide !, Woodrow); Sukkur (Sabnis B550 !, Bhide !); Miani forest, Hyderabad (Bhide !), Larkana (Sabnis B100 !); Sehwan to Laki, foot of hills (Sabnis B66 !); Sehwan, sand dunes (Sabnis B674 !); Sita Road (Sabnis B360 !); Khairpur Mirs, forest (Sabnis B328 !), Phuleh Canal, on banks, at Hyderabad (Sabnis B181 !), Sanghar (Sabnis B895 !); Pad-Idan (Sabnis B517 !); Ghulamalla, fields (Blatter & McCann D643 !), Mirpur Sakro (Blatter & McCann D644 ! D646 ! D647 !); Ghara (Blatter & McCann D645 ! D648 !).

Cutch (Blatter !).

Kathawar Mandvi (Woodrow).

Gujarat Surat (Gammie !), Nadiad Farm (Supt of Farm !); road to Lasandra (Chubber !), Charodi (Gammie 16526 !).

Konkan Palghar, Mahim (Ryan 2189), Bassein (Patwardhan !), Dahana, Thana Dist (Burns !)

Deccan Nasik (Lisboa)

Ecology : A species frequently met with in the drier parts of the Presidency in open waste land and often in fields and on their borders. Its coarse inflorescence easily distinguishes it from any species of *Eragrostis*. It is tufted and very finely rooted which makes it difficult to obtain the whole plant.

Distribution : India, Syria, Egypt, Nubia.

Economic uses : Cattle do not eat it, though the grass is liked by buffaloes. In Afghanistan it is considered to be a good fodder grass. The fibre is used for making ropes.

Medicinal uses : An infusion of the root is used as a diuretic. See Dymock.

Sacred uses : See Watt. Dict. Ec. Prod. III, 254.

Explanation of Plate 162 : *Desmostachya bipinnata* Stapf.

1. Spikelet
2. Lower invol glume.
3. Upper invol. glume.
4. Floral glume
5. Palea.
6. Stamens, ovary and styles.

85. DIPLACHNE Beauv.

Tall tufted perennial (?) grasses; stems erect or ascending, stout or slender, simple or sparingly branched. Leaves flat or convolute, narrow.

Spikelets few- or many-flowered, sessile, 1-seriate on the slender spike-like branches of a contracted subample erect panicle, not articulate at the base, strongly laterally compressed; rachilla articulate between the flowering glumes, not produced beyond the uppermost neuter.

Involucral glumes unequal, membranous, 1-nerved, obtuse, persistent; floral glumes rather longer, elliptic-oblong, 1-3-nerved, the tip 2-4-toothed, mucronate or awned; palea linear. Lodicules 2, broadly cuneate. Stamens 3; anthers short. Styles short, distinct, with distant bases and short plumose laterally exerted stigmas. Grain oblong, stipitate, concave-convex, free in the glumes.

Species about 12.—Warm regions.—Only 1 species in the Presidency.

1. *DIPLACHNE FUSCA* Beauv.

PLATE 163.

Diplachne fusca Beauv. Agrost. (1812) 163; Boiss. Fl. Or. V (1884) 561; Hook. f. Fl. Brit. Ind.

VII (1896) 329; Cooke Fl. Bomb. II (1908) 1030; Haines Bot. Bih. and Or. (1924) 962.

Festuca fusca Linn. Sp. Pl. (1753) 109; Del. Fl. d'Egypt. 24, t. XI, fig. 1.

Uralespis fusca Steud. Syn. Pl. Glum. (1855) 247.

Diplachne indica Spreng. Syst. I (1825) 351.

Tridens indicus Nees in Wight Cat. no. 1794.

Festuca indica Retz. Obs. IV (1786) 21, Kunth Enum. (1838) 412.

Eragrostis procera Steud. l. c. 266.

Poa procera Roxb. Fl. Ind. I (1832) 332.

Uralespis Drummondii Steud. l. c.

Tridens ambigua R. Br. Prodr. (1810) 183.

Bromus polystachyos Forsk. Fl. Aeg.-Arab. (1775) 23.

Rhede Hort. Mal. XII, t. 45.

Vernacular names: Shota gandar. (Known in Australia as Brown-flowered Swamp Grass.)

Etymology: *Diplachne* is derived from *diplous*, double, and *achne*, chaff, very likely alluding to the 2-4-toothed flowering glumes.

Description: Stems tufted, 60-120 cm. high, stout, erect or geniculately ascending, simple or branched (sometimes proliferously), terete, polished, with long internodes. Leaves 15-25 cm. by 1.2-2.5 mm., flat or convolute, strict, erect, smooth, finely acuminate; sheaths smooth, the mouth truncate (not auricled); ligule oblong, membranous, lacerate.

Panicle 15-30 cm. long, erect, narrowly oblong, rachis smooth; branches spike-like, the lower 2.5-10 cm. long. Spikelets erect, rather distant, 6-13 mm. long, linear-oblong, 4-10-flowered; rachilla slender; pedicels short. Lower involucral glume 2 mm. long, oblong-lanceolate; upper involucral glume nearly 3.2 mm. long, ovate-oblong, subacute, broader than the lower; floral glumes 4 mm. long (including mucro), elliptic, thinly coriaceous, 3-nerved, the tip 2-toothed, mucronate by the produced midrib; palea oblong, obtuse, the keels silkily hairy. Anthers 1.2 mm. long.

Locality: *Sind:* Tatta, Kullian Kote Lake (Blatter & McCann D639 !).

Konkan: Parsik, side of railway line (McCann A24 !); Bassein (Bhude !); Sion (McCann 5238 !); Ahbaga, ricefields near salt marshes (Ezekiel !), Lower Parel (Blatter 4283 !); Antop Hill (McCann 3614 !); Mahim to Matunga (McCann 5139 !); Matunga, near Bombay, in ricefields (Woodrow 10).

N. Kanara: Near Karwar, maritime marsh (Sedgwick & Bell 5095 !).

Ecology: Lakes rich moist ground, is distinctly hygrophilous.

Distribution: Upper Gangetic Plain, Bengal, Orissa, W. Peninsula, Ceylon, Egypt, tropical Asia, Africa, and Australia.

Economic uses: Buffaloes are said to like this grass.

Explanation of Plate 163: *Diplachne fusca* Beauv.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, ovary, styles and lodicules.

TRIBE XII: Chlorideae.

Spikelets sessile or subsessile in 2-ranked, secund, usually very dense, rarely loose spikes (or spike-like racemes), or the spikelets more or less pedicelled and panicled; spikes solitary or digitate or racemously arranged on a common axis, rarely in a spike-like panicle or reduced to a fascicle of a few spikelets. Floral glumes generally membranous to chartaceous, entire,

emarginate or 2-4-lobed, 3-nerved, nerves subparallel, distant, the lateral submarginal and usually ciliate or villosulous (additional side-nerves close to the midnerve occur in *Eleusine* sp.); awn, if any, straight, fine, from the truncate or notched tip or all 3 nerves running out into mucros or awns.

See key page XIX.

86 OROPETIUM Trin.

Dwarf densely tufted erect perennial or annual grasses. Leaves short, filiform.

Florets 1-3, hermaphrodite or the upper rudimentary, shorter than the upper involucrel glume. Spikelets minute, half immersed in the alternating distichous cavities of a simple slender curved inarticulate spike, sessile, not articulate on the rachis, rachilla bearded, articulate at the base, not produced beyond the flowering glume. Lower involucrel glume minute, hyaline, persistent, upper involucrel glume linear-lanceolate, rigid, recurved in fruit, tip subobtusate or emarginate, floral glumes concealed by the upper involucrel glume which closes the cavity in which the floral glume is hidden, sessile, ovate or elliptic, hyaline, 1-nerved; callus very short, bearded with silky hairs; palea as long as the glume; keels smooth. Lodicules very minute, obliquely cuneiform. Stamens 3, anthers oblong. Styles short; stigmas plumose, laterally exserted. Grain oblong, smooth, brown, free in the glume.

Species 6.—India, Ceylon, Algeria, S Africa.

1. OROPETIUM THOMAEUM Trin.

Oropetium Thomaicum Trin. Fund. Agrost. (1820) 98, t 3, Kunth Enum. Pl. I (1838) 464; Suppl. 375; Miq. Fl. Ind. Bat. III, 403; Duthie Grasses N. W. Ind. (1883) 45, Fodder Grasses N. Ind. (1888) 69; Hook. f. Fl. Brit. Ind. VII (1896) 366, Cooke Fl. Bomb. II (1908) 1046, Haines Bot. Bih. and Or. (1924) 964.

Nardus Thomaea Linn f. Suppl. (1781) 105; Sm. in Trans. Linn. Soc. I, 116.

Rotboellia Thomaea Koenig in Naturf. XXIII (1788) 210; Willd. Sp. Pl. I, 464, Roxb. Pl. Corom. II, 17, t. 133, Fl. Ind. I (1832) 357; Dalz. & Gibs. Bomb. Fl. (1861) 300.

R. pilosa Willd. l. c. 465.

Etymology: *Oropetium* is derived from *oros*, a mountain, and *pegnumus*, to fasten together, a habitat name.

Description: Whole plant 5-7.5 cm. high, forming hard tufts with capillary root-fibres; stems compressed. Leaves shorter or longer than the stems, erect or curved, filiform, acute, coriaceous, striate, sparsely ciliate with long hairs, sheaths membranous, compressed, ligule an erect lacerate membrane. Spikes 2.5-3.8 cm. by 0.8 mm., erect, straight or slightly curved; rachis undulating, 4-gonous. Spikelets reaching 2.5 mm. long, acute, 1-flowered. Lower involucrel glume minute, hyaline; upper involucrel glume 2 mm. long, linear-lanceolate, rigid, recurved in fruit, floral glume 1.6 mm. long, semicircular in profile, 2-fid, hyaline; callus bearded. Anthers 0.5 mm. long. Grain 0.8 mm. long, somewhat fusiform, reddish brown.

There seem to be two forms, one branched and the other unbranched. Our Dharwar form is the unbranched one.

Locality: Konkan · Trombay, on rocks (McCann A32 !), Antop Hill (McCann 3611 ! 2449 !).

Deccan: Gungapur (Blatter A33 ! 584 !); Poona (Woodrow), Junnar, near Poona (Woodrow).

S. M. Country. Dharwar Dist., dry uplands, 2,400 ft., rainfall 34 in. (Sedgwick 2656 !); Badami, Fort (Bhide !, Talbot 2923 !), Rambennur (Chibber)

Ecology: Very xerophytic. Not uncommon on barren uplands at Dharwar. It is a very short-lived monsoon plant.

Distribution: Throughout the plains of India, Ceylon.

Economic uses: Not known.

87. MICROCHLOA R. Br

Slender usually perennial grasses. Leaves narrow, often subsetaceous, ligule a minutely ciliate rim.

Spikelets 1-flowered, small, sessile, unilateral, crowded on the flattened rachis of a solitary terminal slender curved spike, alternately 2-seriate from near the margins of the rachis or in a single row; rachilla disarticulating above, the involucrel glume more or less produced. Floret hermaphrodite. Glumes 3; involucrel glumes subpersistent, strongly 1-nerved, flattened on the back or keeled, subequal; floral glume small, oblong, hyaline, awnless; palea nearly equalling the glume, 2-keeled. Lodicules 2, cuneate, glabrous. Stamens 3; anthers linear. Styles distinct; stigmas plumose, laterally exserted. Grain oblong, glabrous, free, within the glumes.

Species 7.—1 distributed throughout the tropics, 3 in Africa, 3 in Australia.

1. *MICROCHLOA INDICA* Beauv.

PLATE 164.

Microchloa indica Beauv. Agrost. (1812); O. Kuntze Rev. III (1893) 356; Hackel in Fedde Repert. Nov. Sp. VII (1909) 373; Merrill in Philipp Journ. Sc. Bot. VII (1912) 74; Druce in Rep. Bot. Exch. Cl. Brit. Isles (1916) 635.

Nardus indica Linn. f. Suppl. (1781) 105.

Microchloa setacea R. Br. Prodr. (1810) 208; H. B. & K. Nov. Gen. et Sp. I (1816) 84, t. 22; Beauv. Agrost. (1812) 115, t. 20. fig. 8; Nees Agrost. Bras. (1829) 441; Fl. Afr. Austr. 247; Kunth Enum. Pl. I (1838) 258; Doell in Mart. Fl. Bras. II, III, 76. t. 21; Steud. Syn. Pl. Glum. (1855) 202, Benth Fl. Hongk. (1861) 428, Fl. Austral. VII (1878) 608; Hook f. Fl. Brit. Ind. VII (1896) 283, Cooke Fl. Bomb. II (1908) 1031, Prain Beng. Pl. 1226; Haines Bot. Bih. and Or. (1924) 964.

Rotiboechia setacea Roxb. Fl. Ind. I (1832) 357, Corom. Pl. II, 18, t. 132.

Etymology: *Microchloa* is derived from *micros*, small, and *chloa*, a grass.

Description: Perennial; stems tufted, 5-15 (rarely reaching 25) cm. high, very slender, branched or almost simple, compressed below, glabrous, smooth. Leaves 1.3-3.8 cm. long, crowded at the base, subsetaceous with an acute or callus point, plicate, firm, the lower often curved, usually glabrous.

Spike solitary, 2.5-7.5 cm. (rarely reaching 15 cm.) long; very slender, usually curved, often purplish; rachis minutely ciliate. Spikelets 1-flowered, dorsally compressed, in a single row, 2-3.2 mm. long, erect, glabrous. Involucral glumes subequal, lanceolate-oblong, acute or acuminate; floral glume up to 1.7 mm. long, abruptly and shortly acuminate, sometimes mucronulate, hairy along the nerves, palea ciliate on the nerves. Anthers about 0.6 mm. long. Grain oblong, subfusiform, 1.2 mm. long, smooth.

Locality: *S. M. Country* - Dharwar (Woodrow), on dry hillsides, 2,400 ft., rainfall 34 in. (Sedgwick 2908!); Dumbal (Talbot 2949!)

N. Kanara Halyal (Talbot 2387!)

Ecology: A sporadic grass. Common on barren uplands of Dharwar; often growing on old walls. Has a brief life in the monsoon.

Distribution: Tropics of the Old and New World

Explanation of Plate 164: *Microchloa indica* Beauv.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea
5. Stamens, ovary, styles and lodicules.

88. *GRACILEA* KOEN.

Small tufted grasses. Leaves short.

Spikelets 2-flowered, collected in turbinate fascicles which are secund, sessile and articulate on a slender spike. Spikelets not articulate at the base: rachilla usually produced beyond the upper glume, filiform, scaberulous, callus 0. Glumes 4, involucral glumes elongate-subulate, rigid, ciliate at the base and ending in rigid scabrid awns, persistent, collateral at base and laterally attached to base of spikelet, lower without hyaline margins, the upper with rather wide ones, lower floral glume 2-sexual, chartaceous, ovate-oblong, cymbiform, shortly awned, 3-nerved, the palea as long as the glume, 2-cuspidate and with scaberulous keels, the lodicules minute, cuneiform, truncate, upper floral glume like the lower, but much smaller, bicuspidate, male, sometimes an imperfect flower of 2 empty glumes at the end of the rachilla. Stamens 3; anthers of 2-sexual flowers large, of male flowers small. Styles free, stigmas slender, with short simple hairs, laterally exerted. Grain linear-oblong, free within the glumes.

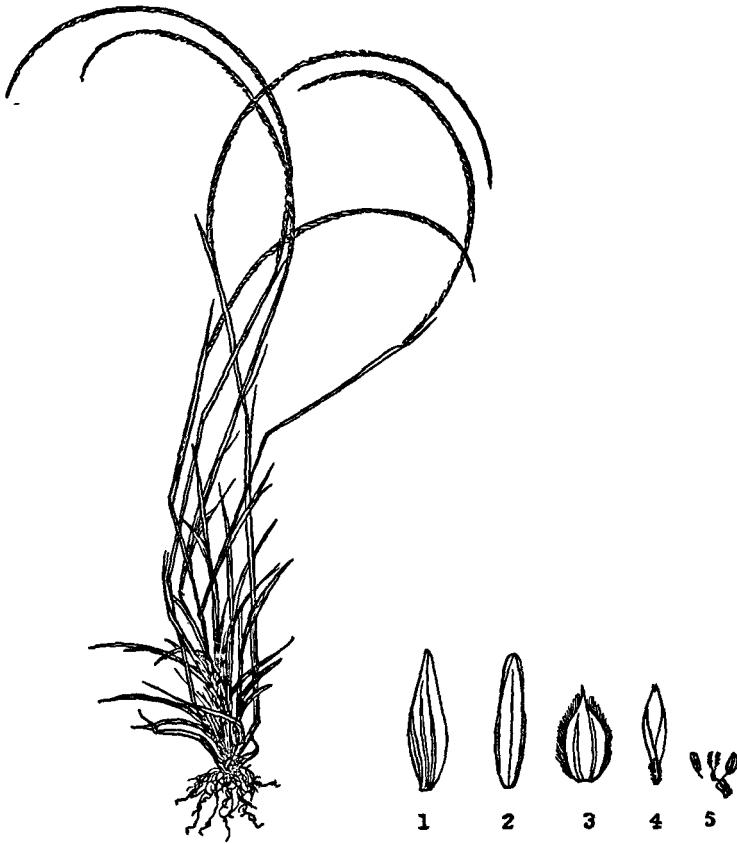
Species 2.—India and Africa

1. *GRACILEA ROYLEANA* Hook. f.

PLATE 165.

Gracilea Royleana Hook. f. Fl. Brit. Ind. VII (1896) 284; Prain Beng. Pl. 1226, Cooke Fl. Bomb. II (1908) 1031; Haines Bot. Bih. and Or. (1924) 965.

Melanocenchris Royleana Nees in Proc. Linn. Soc. I (1841) 95 (*nomen tantum*), Aitchis. Cat. Panjab Pl. (1869) 168 (*excl. syn.*); Duthie Grasses N. W. Ind. (1883) 33, Fodder Grasses N. Ind. (1888) 54, t. 67; Lisboa in Journ. Bomb. Nat. Hist. Soc. VIII (1893) 370.



MICROCHLOA INDICA BEAUV.

Desin: B K Bhida.



GRACILEA ROYLEANA HOOK. F.

Desm: B K

M. Jacquemontii Jaub. & Sp. III. Pl. Or IV (1850-53) 36, t. 325.

Pommerehnia Royleana Steud. Nom. ed II, II (1846) 379.

Vernacular names : Guh, Bedari, Dongri, Landgeya-kussal, Landga-kussal.

Etymology : *Gracilea* is derived from *gracilis*, graceful, slender.

Description : Annual ; stems 7.5-20 cm. high, densely tufted, very slender. Leaves 2.5-5 cm long, scarcely reaching 1-6 mm. broad, flat or convolute, linear-lanceolate, acutely pointed, glabrous or nearly so, the margins ciliate ; sheaths with a few long scattered hairs ; ligule a hairy ridge.

Spikes filiform, 1.3-5 cm. long, flexuous, often recurved, rhachis 3-gonous, smooth. Clusters of spikelets 6-8.5 mm. long (including the awns), green or purple, awns of involucreal glumes longer than the glumes ; awn of floral glumes short.

Locality : Cutch - Bhuj Hill (Blatter 3764 !).

Gujarat - Daman (Bhide !).

Khandesh - Toranmal, rocks (McCann A54 !), Amalner, Bori River (Blatter & Hallberg 4451 !), Tapti, Bhusawal (Blatter & Hallberg 5453 !), to Naradana (Blatter & Hallberg 5312 !).

Konkan : Bandra (Ryan 1432 !); Parsik (Ryan 1215 !); Trombay (McCann A52 !), Worli Hill, common along seashore (McCann 5516 !), Antop Hill (McCann 3612 !).

W Ghats - Panchgani (Blatter & Hallberg B1278 !); Khandala to Campoli (McCann A57 !).

Deccan - Katraj (Bhide !), Sinhagad forest (Bhide !), Near Poona (Jacquemont 383), Poona (Woodrow !); Pashan, near Poona (Gammie !), Chattarshinji Hill, Poona (Ezekiel !), Kirkee (Gammie !), Deolali (Blatter A53 ! 4545 !).

S. M. Country - Dharwar Dist., 2,000 ft., rainfall 35 in. (Sedgwick 2278 !); Yelving, dry hillside, 1,800 ft., rainfall 28 in. (Sedgwick & Bell 4902 !); Dharwar (Talbot 2008 !); Belgaum (Stocks, Ritchie 831).

N Kanara : Yellapur (Talbot !), Karwar (McCann !).

Ecology : Common in stony and barren places, near the sea or far inland up to considerable elevations.

Distribution : Bihar, Rajputana, W. Peninsula, Socotra, Nubia.

Economic uses : "It is said to be a good grazing grass when young, though rather too small to be of much use" (Duthie).

Explanation of Plate 165 : *Gracilea Royleana* Hook. f.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume
4. Floral glume.
5. Palea
6. Grain
7. Upper floral glume
8. Palea of upper floral glume.

VAR. PLUMOSA Hook. f.

Var. plumosa Hook. f. Fl. Brit. Ind. VII (1896) 284 ; Cooke Fl. Bomb. II (1908) 1031.

Melanocenchris plumosa Jaub. & Sp. I. c. 37 ; Hochst. in Flora (1855) 273, 417.

Pennisetum plumosum Hochst. ex Steud. Syn. Gram. 201

Ptilonema plumosum Steud. l. c.

Eutriana abyssinica R. Br. ex Fresen. in Mus. Senkenb. II (1837) 142.

Description : Clusters of spikelets larger, 13 mm. long including the awns

Locality : Sind. Jemadar ka Landa near Karachi (Stocks 646)

Distribution : Punjab, Sind, Arabia, Abyssinia.

89 CYNODON Rich.

Perennial glabrous grasses, stems creeping, rooting at the nodes and emitting from them fascicles of barren shoots and flowering stems.

Spikes 2-6, in terminal umbels. Spikelets 1-flowered, laterally compressed, sessile, unbricate, alternately 2-seriate and unilateral on a slender keeled rhachis, rhachilla disarticulating above the involucreal glumes, produced or not beyond the floral glume. Floret hermaphrodite. Involucreal glumes narrow, keeled, acute or subulate-mucronate, the upper usually deciduous with the floral glume, the lower subperistent ; floral glume exceeding the involucreal glumes, nervicular, firmly membranous, 3-nerved, awnless, the keel ciliate ; palea somewhat shorter

than the glume, 2-keeled. Lodicules 2, minute, obovate-cuneate, glabrous. Stamens 3. Ovary glabrous; styles distinct, slightly shorter than the plumose stigmas. Grain oblong, subterete, free within the glumes.

Hitchcock (U. S. Dept. Agric. Bull. No. 792 (1920), 178) considers *Panicum dactylon* Linn. as the type species. He justifies the change of *Cynodon* into *Capriola* in these words: "*Capriola* Adans., Fam. Pl. 2: 31, 532, 1763." The genera are indicated and distinguished by Adanson in a much abbreviated and often unsatisfactory manner. The tabular arrangement of the genera of *Phalarides*, his first section of the grass family or *Gramina*, includes *Capriola*, with the following diagnosis, interpreting the table: Summit of leaf sheath hairy; flowers in digitate spikes; glumes laterally compressed; lemma awnless. In the index there is given as a synonym under *Capriola*, '*Gramen dactylon* Offic.' The last phrase appears in the first edition of the Species Plantarum in the synonymy under *Panicum dactylon* as '*Gramen dactylon, radice repente s. officinarum*, Scheuch. gram. 104.' thus connecting *Capriola* Adans. with *Panicum dactylon*.

"*Cynodon* Rich., Pers Syn. 1: 85, 1805. Only one species described, *C. dactylon*, based on *Panicum dactylon* L."

In spite of this we have to retain *Cynodon*. Mr. Hubbard of the Kew Herbarium informs us that *Cynodon* is on the list of *nomina conservanda* and according to International Rules must be used, although it is antedated by *Capriola* Adans. (1763).

Species 7.—India, S. Africa, Australia.—Only one in the Bombay Presidency.

1. *CYNODON DACTYLON* Pers.

PLATE 166.

Cynodon dactylon Pers. Syn. I (1805) 85; Dalz. & Gibs. Bomb. Fl. (1861) 297; Duthie Grasses N. W. Ind. (1883) 32, Fodder Grasses N. Ind. (1888) 52, Hook. f. Fl. Brit. Ind. VII (1896) 288, Cooke Fl. Bomb. II (1908) 1032.

C. erectum Presl Reliq. Haenk. I (1830) 290.

C. filiformis Voigt Hort. Subsub. Calc. 712.

C. linearis Willd. Enum. Hort. Berol. I (1827) 90

C. maritimus H. B. & K. Nov. Gen. et Sp. I (1816) 170.

C. radiatus Roth Nov. Pl. Sp. (1821) 38.

Chloris Cynodon Trin. Gram. Unifl. 229.

C. maritima Trin. l. c. 226.

Fibuschia umbellata Koel. Gram. Gall. et Germ. 308.

Digitaria Dactylon Scop. Fl. Carn. Ed. 2, I, 52.

D. littoralis Salisb. Prodr. 19.

Panicum dactylon Linn. Sp. Pl. (1753) 58; Grah. Cat. Bomb. Pl. (1839) 236; Roxb. Fl. Ind. I (1832) 289

P. lineare Burm. Fl. Ind. (1768) 25, t. 10, fig. 2.

Paspalum dactylon DC. Fl. Franc. III, 16.

Agrostis bermudiana Tussac ex Kunth Enum. Pl. I (1838) 259.

A. filiformis Koen. ex Kunth l. c. 261.

A. linearis Retz. Obs. IV (1786) 19.

Rheede Hort. Mal. XII, t. 47.

Vernacular names: Doub grass, Bermuda grass, Wire grass, Couch grass, Dhoob, Durba, Durva, Harala, Haryeli, Dubra dub, Nihdub.

Etymology: *Cynodon* is derived from *kyon*, a dog, and *odous*, tooth, therefore dog's tooth. —*Dactylon* is the Greek *dactylos*, finger, alluding to the shape of the inflorescence.

Description: Stem slender, prostrate, widely creeping, forming matted tufts, with slender erect or ascending flowering branches 7.5-30 cm. high. Leaves 2-10 cm. by 1.2-3 mm., narrowly linear or lanceolate, finely acute to pungent, more or less glaucous, soft, smooth, usually conspicuously distichous in the barren shoots and at the base of the stems; sheaths tight, glabrous or hairy, sometimes bearded at the mouth; ligule a very fine ciliate rim. Spikes 2-6, radiating from the top of a slender peduncle, 2.5-5 cm. long, green or purplish; rachis slender, compressed or angled, scaberulous.

Spikelets 1.7-2.5 mm. long; rachilla produced, very slender, equalling half the length of the spikelet. Involucral glumes lanceolate, acute to subulate-mucronulate, the lower 1-1.6 mm. long, the upper slightly longer; floral glume obliquely oblong to semiovate, about 2 mm. long. Anthers oblong, 1 mm. long. Grain 1 mm. long.

Locality: *Sind:* Sita Road (Sabnis B361 !); Jamesabad, fields (Sabnis B907 ! B1108 !); Sanghar (Sabnis B896 !); near Phuleli Canal, cultivated fields (Sabnis B135 !); Mirva Canal, sandy banks (Sabnis B265 !); Sehwan to Laki, foot of hills (Sabnis B300 !); Mirpurkhas,



CYNODON DACTYLON PERS.

Delin: B. K. Bhude.

fallow fields (Sabnis B1190 !); Baghar (Blatter & McCann D690); Gizri, near Karachi (Sabnis B783 !); Larkana (Sabnis B458 ! B477 !).

Cutch (Blatter 8553 !).

Kathawar - Junagad (Blatter 3785 !).

Gujarat : Dakor (Chibber !).

Khandesh Ankai Hill (Blatter !), Bor, Bor River (Blatter & Hallberg 5482 !).

Konkan. Very common in Bombay and Salsette Islands (McCann !); Parsik, railway line (McCann A181 !); Vehar Lake (McCann 182 !).

W. Ghats Igatpuri (Blatter & Hallberg 5486 !, McCann !), Khandala, very common (McCann 5433 ! 5301 !); Panchgani (Blatter & Hallberg B1264 ! B1270 ! B1329 !).

Deccan Deolali (Blatter & Hallberg 4570 !); Purandhar, north foot and top (McCann 5042 ! 5604 ! bis), Wai (Mamlatdar of Wai !).

S. M. Country. Devarayi forests, 1,800 ft. (Sedgwick & Bell 4102 !), Dharwar (Sedgwick !), Haveri (Talbot !).

N. Kanara (McCann !).

Ecology : Grows everywhere abundantly and flowers throughout the year. Propagates readily by its rhizomes and stolons and, therefore, may become a pest in cultivated fields.

Distribution : Cosmopolitan.

Economic uses : This is one of the most important pasture grasses, under favourable conditions it may even grow sufficiently rank to be cut as hay; also widely utilised as a lawn grass.

Explanation of Plate 168 : *Cynodon dactylon* Pers.

1. Spikelet
2. Lower invol glume.
3. Upper invol glume.
4. Floral glume.
5. Palea.
6. Stamens, ovary and styles.

90. ENTEROPOGON Nees.

Tall, slender, perennial grasses. Leaves long, very narrow.

Spikelets very narrow, 1-2-flowered (lower flower perfect, upper if present male or neuter), unilateral in a solitary terminal slender spike, not jointed at the base; rhachilla jointed at the base. Glumes 3 or 4. Lower involucral glumes unequal, narrow, hyaline, 1-nerved, persistent; lower floral glume much larger, linear, rigid, scabrid, dorsally rounded, 3-nerved, tip entire, or acutely bifid with a short erect awn in the cleft; callus bearded. Palea lanceolate, 2-toothed, keels scabrid. Lodicules 2. Anthers very long. Styles distinct. Grain narrow, free within the hardened glumes.

Species 4 —India, tropical Africa and Asia.

1. ENTEROPOGON BADAMICUM Bhide.

Enteropogon badamoum Bhide in Journ. & Proc. As. Soc. Beng. new series, VII (1911) 517.

Description : Stem 60-75 cm., slender, erect, glabrous. Leaves narrow, 10-18 cm. by 3-6 mm., tapering to a fine acumination, glabrous; sheath glabrous, finely long-ciliate at the mouth and sides, ligule a short membrane with a fine fringe of hairs. Spike solitary, terminal, 15 cm. long.

Spikelets 2-seriate and secund on a flattened, trigonous, slightly scabrid rachis, subsessile or very shortly pedicelled. Involucral glumes persistent, empty, scarious, 1-nerved, glabrous or very minutely puberulous, the lower less than half of the upper, more or less unequal-sided and sometimes slightly lobed on one side, ovate, subacute and erose at the apex; upper shortly unequally 2-dentate at the apex with a short mucro between. Lower floral glume slightly longer than upper involucral, 2-dentate at the apex, 3-nerved with a dorsal stiff awn about as long as the glume, scabrid at the back and sides, ventrally grooved, the groove corresponding with the dorsal ridge which is continuous with the awn. Callus bearded with short white silky hairs. Palea a little longer than the glume, scabrid at the back and on the keels 2-nerved, apex slightly bifid and erose, with a bisexual flower. Grain oblong, flattened, as long as the palea. Upper floral glume like lower, but smaller and also bisexual; rhachilla produced beyond the upper floral glume and bearing a sterile awned glume which is much smaller than the upper floral glume.

Locality : *S. M. Country* : Badami (Bhide ! Talbot 2924 !).

Distribution : So far endemic.

91. *Chloris* Swartz.

Annual or perennial grasses. Leaves flat or convolute. Spikes solitary or several, in terminal umbels or short racemes, erect or stellately spreading.

Spikelets of 2-4 florets (1 only or rarely more fertile), sessile, crowded, unilateral, 2-seriate on a slender rhachis, rhachilla disarticulating above the involucrel glumes, more or less produced, lowest floret hermaphrodite, the second male or barren (rarely fertile), the following if present barren, often minute (some occasionally fertile in *C. tenella*). Involucrel glumes 2, persistent, narrow, keeled, membranous, 1-nerved, acute, mucronate or the upper awned. Hermaphrodite floret: floral glume narrow or broad, 3-nerved, acute or obtuse, minutely 2-toothed, usually awned from below the apex, often ciliate, pales almost equalling the glume, 2-keeled. Lodicules 2, minute. Stamens 3. Ovary glabrous; styles distinct, short, stigmas laterally exerted. Male floret glume and pales as in the hermaphrodite flower but smaller and glabrous. Rudimentary florets glabrous, awned or awnless, small to minute, usually without a trace of a pales.

Species about 75.—Tropical and subtropical regions of the Old and New World.

Cooke has 4 species. We add 5 more: *C. pallida*, *C. gunnquestroa*, *C. virgata*, *C. montana* and *C. gayana*.

- A. Rhachilla not at all produced beyond the lower flowering glume 1. *C. pallida*.
- B. Rhachilla produced beyond the lower flowering glume.
- I. Rhachilla produced beyond the flowering glume and bearing 1 awn 2. *C. incompleta*.
- II. Rhachilla produced beyond the flowering glume and bearing 1-4 reduced empty glumes.
1. Spikes 1-3. Lower flowering glume broadly cuneiform 3. *C. tenella*
2. Spikes 1-3. Lower flowering glume ovoid, hirsute all over 4. *C. villosa*.
3. Spikes 2-10. Lower flowering glume bearded at the base and on the margins above the middle
- a. Rhachilla bearing 1-2-awned, tubular or inflated glumes
- * Upper involucrel glume awned 5. *C. virgata*.
- ** Upper involucrel glume awnless 6. *C. barbata*.
- b. Rhachilla bearing 3-4 empty glumes
- Spikelets 4-awned altogether 7. *C. montana*.
4. Spikes 5-18.
- a. Spikes 2-5-5 cm. long 8. *C. gunnquestroa*
- b. Spikes 6-10 cm. long 9. *C. gayana*.

1. *Chloris pallida* Hook. f.

PLATE 167.

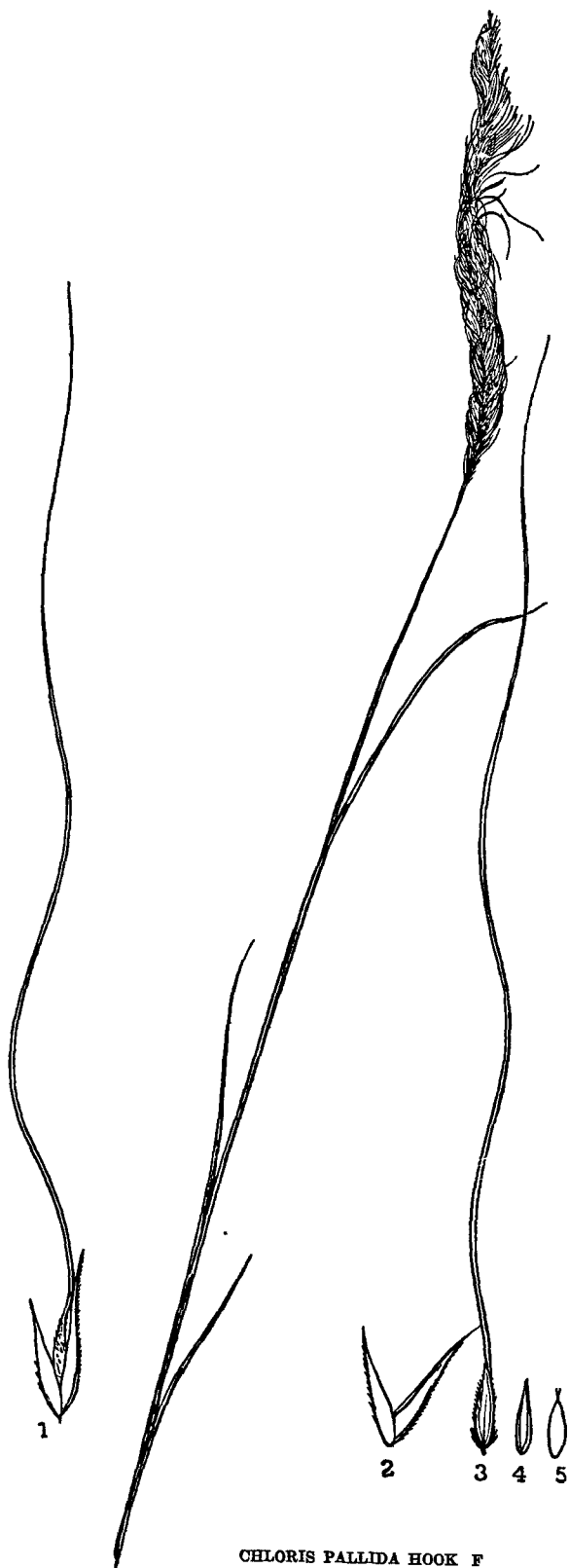
Chloris pallida Hook f. Fl. Brit. Ind. VII (1896) 289, Haines Bot. Bih. and Or. (1924) 967.
Schoenfeldia pallida Edgew. in Journ. As. Soc. Beng. XXI (1852) 161, 183; Aitch. Cat. Panjab Pl. (1869) 166; Duthie Grasses N. W. Ind. (1883) 32, Fodder Grasses N. Ind. (1888) 52, t. 64.

S. gracilis Kunth Rev. Gram. I (1829) 263, t. 53, Enum. Pl. I (1838) 258; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 365.

Etymology: *Chloris* is derived from *chloros*, green.—*Pallida* means pale.

Description: A slender tufted annual, 25-45 cm. high; stems simple or branched, almost filiform. Leaves 10-20 cm. long, linear, very narrow, flaccid, tips capillary, sparsely hairy inside towards the base, hagle of a few hairs.

Spikes 1-3, erect, digitate, golden-yellow, 7-13 cm. long, up to 5 mm. broad, closely pectinate with the two rows of erect-patent long-awned spikelets. Spikelets narrow, tapering, about 2 mm. long without the awns, sessile. Involucrel glumes ovate-lanceolate, subaristately acuminate, 1-nerved, keels ciliate, lower $\frac{1}{2}$ shorter than the upper. Lower floral glume rather longer than the lower involucrel, sessile, ovate, 1-nerved, hairy, base bearded, tip minutely notched, awn 15-25 mm. long, capillary, curved. Pales narrow, keels ciliate, tip 2-dentate.



CHLORIS PALLIDA HOOK F

Delin: B. K. Bhide.



CHLORIS INCOMPLETA ROTH.

Delin: E. K. El

Grain linear, very slender, acute, pericarp loose. Rhachilla not produced beyond the lower floral glume. No rudimentary upper floral glume.

Locality : Gujarat - Sevaha (Chibber !); Lasandra (Chibber !), Kharaghoda, dry salt ground (G C H 537 !).

W. Ghats. Lonavla (Gammie !).

Deccan - Charodr (Gammie 16531 !)

Ecology : A subgregarious species. Grows in dry sandy places.

Distribution : Bundelkhand, Bihar, Central India, W. Peninsula.

Explanation of Plate 167 : *Chloris palhda* Hook. f.

1. Spikelet.
2. Lower and upper invol. glume
3. Floral glume,
4. Palea.
5. Grain.

2. *CHLORIS INCOMPLETA* Roth.

PLATE 168

Chloris incompleta Roth Nov. Pl Sp (1821) 60; Steud. Syn. Pl. Glum. (1855) 207, Hook. f. Fl. Brit Ind VII (1896) 290, Cooke Fl. Bomb. II (1908) 1034, Achariyar S. Ind. Grasses (1921) 258, Haines Bot. Bih. and Or. (1924) 968.

Chloris digitata Steud. l. c., Duthie Grasses N W Ind (1883) 23, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 369 (excl. syn.).

C. radiata Heyne ex Roth l. c. 61.

C. Roxburghii Edgew. in Journ. As. Soc. Beng XXI (1853) 160, 183; Duthie Fodder Grasses N Ind. 54, t. 65, Lisboa l. c. 368.

C. tetramenis Trin. Gram. Unifl. (1824) 235; Steud. l. c. 206.

Digitaria elongata Spreng. Syst. I (1825) 271.

Gymnopogon digitatus Nees in Wight Cat. no. 1753 (ex Hook. f.); Steud. Nom. ed. II, I (1840) 713.

Melica digitata Roxb. Fl. Ind I (1832) 326; Kunth Enum. Pl. I (1838) 37.

Ctenium digitatum Spreng l. c. 274.

Cynodon elongatus Trin. in Spreng N. Entdeck. II, 64.

Vernacular names : Kuncha, Bamna, Mathanya, Nika gadi.

Etymology : *Incompleta* means incomplete.

Description : Perennial, stems procumbent, or erect when growing amongst bushes, reaching a height of 1.5 m., ending in a very long naked peduncle. Leaves 15-30 cm. by 4-13 mm., narrowed into a fine point, flat, glabrous or slightly hairy, sheaths long, smooth, the mouth hairy, ligule of long hairs.

Spikes 4-6, in terminal whorls, 10-23 cm. long; rachis filiform, scabrid. Spikelets 5 mm. long (excluding the awns), narrowly fusiform, monostachy, erect, closely appressed; rachilla slender, bearing 1.6 mm. from its base a tuft of hairs, a little above, which is a barren glume terminated by a long awn reaching 8.5 mm. long. Glumes 4; lower involucre glume 2.5 mm. long, lanceolate, acute, upper involucre glume 5 mm. long (excluding awn), narrowly lanceolate, membranous, 2-toothed at the apex with a strong midnerve which is produced into an awn 1.2 mm. long; floral glume of fertile floret as long as the upper involucre glume, oblong-lanceolate, 2-toothed at the apex, with an awn 1 mm. long, palea as long as the glume, acuminate; callus bearded; 14th glume small, rudimentary.

Locality : Gujarat - Balsar, in the shade of trees (Sedgwick 1114 l.).

Khandesh - To Toranmal, in a stony watercourse (McCann 9773 l. 9774 l.).

Konkan - Thana (Lisboa).

Deccan - Nasik (Lisboa).

S. M. Country. Deciduous forests west of Dharwar, 2,000 ft., rainfall 40 in. (Sedgwick & Bell 4499 l.).

N. Kanara : (Woodrow); Goand (Talbot 2203 l.); Halyal (Talbot 2382 l. 2220 l.).

Ecology : A sporadic grass. Likes hedges, thickets, and attains then a considerable height.

Explanation of Plate 168 : *Chloris incompleta* Roth.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume
5. Palea, and production of rachilla bearing an empty awned glume.

3. *CHLORIS TENELLA* Koen.

PLATE 169.

Chloris tenella Koen. ex Roxb. Hort. Beng. (1814) 82, Fl. Ind. I (1832) 329; Kunth Enum. Pl. I (1838) 267, Spreng. Neue Entdeck. III (1822) 126; Steud. Syn. Pl. Glum. (1855) 204; Dalz & Gibs. Bomb. Fl. (1861) 296; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 368; Hook. f. Fl. Brit. Ind. VII (1896) 291; Cooke Fl. Bomb. II (1908) 1033; Acharyar S. Ind. Grasses (1921) 259.

C. triangulata Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 409; Steud. l. c. 203; Duthie Grasses N. W. Ind. (1883) 33.

Ctennum indicum Spreng. Syst. I (1825) 274

Tetrapogon triangularis Hochst. Pl. Arab. Schweinf. no. 967 (ex Hook. f.).

Vernacular name : Kanya.

Description : Annual, very slender, stems 25-45 cm. long, weak, slender, branched from the base. Leaves 7-5-20 cm. by 3-6 mm., flaccid, linear-lanceolate, finely acuminate, the margins more or less ciliate towards the base; sheaths glabrous; ligule large, membranous, truncate.

Spike solitary, 2-5-5 cm. long, erect, flat. Spikelets large, reaching 6 mm. long, cuneate, bifarious, 3-awned. Glumes 5 or 6; lower involucre glume 4 mm. long, strongly 1-nerved; upper involucre glume longer and broader, with a strong midnerve which is produced into a short awn; glume of hermaphrodite floret 5 mm. long, broadly cuneate, the upper margin truncated, naked, and with a scaberulous awn 4 mm. long from the back below the apex, the palea elliptic with ciliate margins, and the callus densely hairy, the next or second floral glume smaller but similar, with a similar palea, the others still smaller fan-shaped awned. Sometimes one or more of the normally infertile glumes are found to be fertile, at other times all are barren.

Locality : Sind - Jemadar ka Landa, near Karachi (Stocks).

Gujarat - Surat, on the city walls (Dalzell).

Khandesh - West Khandesh (Blatter!).

Deccan - Bijapur (Woodrow).

S. M. Country - Badami Fort (Bhude!).

Distribution : Rajputana, W. Peninsula, S. India, Arabia, Abyssinia.

Economic uses : Considered to be a good fodder at Ajmere.

Explanation of Plate 169 : *Chloris tenella* Koen.

1. Spikelet.
2. Lower and upper invol. glume.
3. First floral glume.
4. Palea of first floral glume.
5. Stamens, grain and styles of first floret.
6. Second floral glume.
7. Palea of second floral glume.
8. Stamens, ovary and styles of second floret.
9. Third floral glume.
10. Palea of third floral glume.
11. Stamens, ovary and styles of third floret.

4. *CHLORIS VILLOSA* Pers.

Chloris villosa Pers. Syn. I (1805) 87; Kunth Enum. Pl. I (1838) 267, Suppl. 217, t. 16, fig. 3; Jaub & Sp. III. Pl. Or. IV, 40, t. 327; Coas. & Dur. Fl. Alger. 87; Aitchis. Cat. Panjab Pl. (1869) 167; Hook. f. Fl. Brit. Ind. VII (1896) 291; Cooke Fl. Bomb. II (1908) 1034.

Chloris tetrapogon Beauv. Agrost. (1812) 158.

Tetrapogon villosus Desf. Fl. Atlant. II, 388, t. 255, Trin. Fund. Agrost. (1820) 760; Boiss. Fl. Or. V (1884) 555; Duthie Grasses N. W. Ind. (1883) 33, Fodder Grasses N. Ind. (1888) 55, t. 68.

Description : Perennial, stout; stems 15-25 cm. long from a densely tufted stout woody base, clothed with equitant leaf-sheaths. Leaves 2-5-7-5 by 1-6-2-5 mm., linear, acute, flat, convolute or twisted, rigid; ligule obacure.

Spikes 1-3, erect, pale yellow, 3-8-6-3 cm. by 8-5-13 mm. Spikelets 3-2 mm. long, obconic, with 4 unequal awns. Glumes 5; lower involucre glume 3-2 mm. long (including a short awn), oblong-lanceolate, hyaline; upper involucre glume 4 mm. long, oblong, hyaline, 2-toothed at the tip and shortly awned, glume of the hermaphrodite floret 3-2 mm. long, broadly ovate or suborbicular, concave, with an awn 6 mm. long or more, and broad hyaline margins bounded by the lateral nerves, hirsute all over with long silky hairs which are much longer than the glume, the palea elliptic-obovate with ciliate margins, hyaline; the next glume (IVth) barren, about half as long, also hirsute, the next (Vth) small, cuneate, the Vth reduced to an awn.



CHLORIS TENELLA KOEN.

Delin: B. K. Bhode



CHLORIS VIRGATA SW.

Dolin: B. K. 8

Locality : *Sind* : Gharo (Blatter & McCann D655 !).

Gujarat : Ahmedabad (Sedgwick !).

S. M. Country : Shuavar, on dry bunds, 2,000 ft., rainfall 35 in. (Sedgwick 3095 !); Yelvigi, 2,000 ft., rainfall 30 in. (Sedgwick 1923 !)

Ecology : A subgregarious species. Reappears on barren white soil of the Carnatic.

Distribution : Punjab, Rajputana, W. Peninsula, westward to the Canaries.

5. CHLORIS VIRGATA SW.

PLATE 170.

Chloris virgata Sw. Fl. Ind. Occ. I (1797) 203; Trin. Gram. Unif. 136, Doell in Mart. Fl. Bras. II, III; Hook. f. Fl. Brit. Ind. VII (1896) 291; Achariyar S. Ind. Grasses (1921) 260; Haines Bot. Bih. and Or. (1924) 968.

Rabdochloa virgata Beauv. Agrost. (1812) 84.

Chloris compressa DC. Cat. Hort. Monsp. (1813) 94; Nees Agrost. Bras. (1829) 421; Fl. Afr.

Austr. (1841) 240; Steud. Syn. Pl. Glum. (1855) 204.

C. caudata Trin. ex Bunge Enum. Pl. Chin. Bor. 70.

C. cryptostachys Steud. in Schmidt Fl. Cap. Virid. 148.

C. decora Nees in Herb. Royle; Steud. l. c. 205.

C. elegans Kunth Enum. Pl. I (1838) 264.

C. meccana Hochst. & Steud. ex Schult. Ind. Sem. Hort. Hal. (1843) 7; Steud. l. c.; Boiss. Fl.

Or. V (1881) 554; Duthie Grasses N. W. Ind. (1883) 33.

C. montana Griseb. in Goett. Nachr. (1868) 84, Abhandl. 300; Duthie l. c. (non Roxb.).

C. pallida Link. Hort. Berol. I (1827) 56, II, 223.

C. pericillata Hort. ex Nees. l. c. (non Poir.).

C. polydactyla Durand Diss. Chlorid. (1808) 14, 22, Jacq. Eclog. Gram. 12, t. 9 (non Sw.).

C. tetrastrachys Hack. mss. (ex Herb. Duthie)

Heterolepis elegans Ehrh. ex Boiss. l. c.

Vernacular names : Kharrut, Sakalu, Gadhiu, Fulkalu, Falu, Khariu, Gonde gavat, 'Ganjali hullu.

Etymology : *Virgata* means virgate, twiggy.

Description : A tufted leafy annual grass, 30-60 cm. high. Stems somewhat flattened, erect, leafy at the base, occasionally with creeping stems rooting at the lower nodes. Leaf-blades rather narrow, linear, flat, acute, glabrous when old, with scattered long hairs in the leaves of young branches, 5-25 and even 40 cm. long, 3 mm. or less broad. Sheaths glabrous, compressed, upper ones somewhat inflated, margins thin and membranous, mouth of sheath bearded with long hairs in the leaves of young branches, quite glabrous when old and in flower-bearing branches.

Ligule a thin, narrow, membranous ridge. Spikes 6-15, erect, crowded at the end of the peduncle, 2.5-6 cm. long, rachis fine, angular, scaberulous on the edges. Spikelets about 2.5 mm. long excluding the awns, 2-awned, short-stalked, consisting of 4 glumes. Lower involucre glume slender, subulate, glabrous, with the keel glabrous, 1-nerved, about half the upper; upper involucre glume oblong-lanceolate, 2-fid at the apex, glabrous except the scaberulous keel, nerve produced between the lobes into a scaberulous awn. Lower floral glume oblong-ovate, cymbiform and rather deep, bifid at the apex and awned in the sinus, margins slightly ciliate up to about the middle and then closely ciliate with long hairs almost to but not to the tip, awn about 6 mm. long, bearded at base, on each side of the dorsal nerve there is a shallow groove with short scattered appressed hairs. Palea much narrower and rather shorter, often reduplicate, toothed or notched. Rhachilla somewhat adnate to lower floral glume, shortly produced, bearing a curious semitubular or bucciniform truncate glume with 2 minute auricles at tip and an awn 8 mm. long. Grain fusiform, sometimes slightly curved, pericarp loose.

Locality : *Gujarat* : Sungiri (Gammie 16585 !); Perim Isl., Gulf of Cambay (Blatter 3816 ! 3820 !).

Khandesh : Bor, Bori River (Blatter & Hallberg 4425 !); Toranmal, S. E. slope (McCann A194 !).

Konkan : Lower Parel (Blatter 4279 !), very common in Bombay Isl. (McCann !); Parsuk, railway line (McCann A195 !).

W. Ghats : Igatpuri (Blatter & Hallberg 5118 ! 5145 !).

Deccan : Abundant on old walls of houses in Poona (Acharyar); Mangri, near Poona (Gammie 15342 !); Lana Hill, Nasik Dist. (Blatter & Hallberg A190 !); Sholapur, (D'Almeida A193 !); Katraj Ghat (Gammie 1042 !); Gangapur (Blatter & Hallberg 4574 !).

S. M. Country : Hubli, 2,000 ft., rainfall 30 in. (Sedgwick & Bell 4219 !); Dharwar, 2,500 ft., rainfall 34 in. (Sedgwick 1818 !)

Ecology : A subgregarious plant. Abundant in dry places of the Carnatic.

Distribution : Kashmir (Ladak), Rajputana, Gangetic Plain, Bihar, Burma, W. Peninsula, Central and S. India, westward to Algeria; Mongolia, tropical and S. Africa and America.

Explanation of Plate 170 : *Chloris virgata* Sw.

- 1 Lower and upper invol. glumes and floral glume.
2. Floral glume
3. Palea
4. Grain
5. Second floral glume.

6. CHLORIS BARBATA Sw.

PLATE 171.

Chloris barbata Sw Fl Ind. Occ I (1797) 200, Jacq. Eclog. Gram 10, t 6; *Numa numm.* Pl I (1838) 264, Suppl. 209, Trin. Diss I, 232, Sp. Gram. Ic. t. 306; Nees Agrost. Bras. 421; Steud. Syn. Gram 204, Roxb Fl. Ind. I (1832) 329; Grah. Cat. (1839) 234; Aitchis. Cat. Panjab Pl. (1869) 167, Duthie Grasses N. W. Ind. (1883) 33, Fodder Grasses N. Ind. (1888) 53, t. 34, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 367, Griseb. Fl. Brit. W. Ind. (1864) 539, Benth. Fl. Hongk. (1861) 429, Fl. Austral VII (1878) 613 (*excl. syn. decora*), Doell in Mart. Fl. Bras. II, III, 67, Hook. f. Fl. Brit. Ind. VII (1896) 292, Prain Beng Pl 1227, Watt Dict. Econ. Prod. II, 269, Cooke Fl. Bomb. II (1908) 1035, Acharyar S. Ind. Grasses (1921) 264, Haines Bot. Bh. and Or. (1924) 969.

Andropogon barbatus Linn. Pl. Jam. Pugill 30, Mantiss. II, 302.

Rheede Hort. Malab. XII, t. 51.

Etymology : *Barbata* means bearded, alluding to the lower floral glume.

Description : Perennial, stems tufted, with strong root-fibres, rather stout, 60-90 cm. high, geniculately ascending, branching upwards, leafy, quite smooth, lower internodes 5-7.5 cm. long, as thick as a crow-quill, shining; upper very long, slender; nodes often bearing equitant tufts of leaves. Leaves 15-45 cm. long, narrowly linear, flat or folded, finely acuminate; sheaths smooth, the lower open, ligule a very narrow membrane.

Spikes 5-20, digitately arranged in a truncate fascicle, 1.3-10 cm. long, on a slender peduncle, often purplish. Spikelets 2.5 mm. long (excluding the awns), green or purple, 3-awned; rhachilla produced, but not beyond the fertile glume bearing 2 small turgid obovate awned barren glumes 1.6 mm. long, the awns 3-2.4 mm. long. Involucral glumes hyaline, lanceolate, acute (not awned), lower 1.6 mm. long, upper 2.5 mm. long, floral glume of hermaphrodite floret 2.5 mm. long, broadly elliptic, shortly apiculate, with a slender awn 3-2.4 mm. long and with densely bearded margins above the middle, palea nearly as long as the glume, oblanceolate.

Locality : Sand. Mirpur Sakro (Blatter & McCann D656 !); Tatta (Blatter & McCann D657 !).

Khandesh : Narmada bank (Blatter & Hallberg 5399 !); to Naradana (Blatter & Hallberg 5163 ! 5182 !), Umalla, Tapti Bank (Blatter & Hallberg A188 !).

Kanhan : Patel, very common in Bombay Isl (McCann 5381 !), Sion (McCann 5220 ! 5245 !).

Deccan : Chhatrashtunji Hill, Poona (Ezekiel !), Jeur, Ahmednagar Dist. (Woodrow !).

S. M. Country : Dharwar Dist., 2,000 ft., rainfall 35 in. (Sedgwick 1962 !); Haveri (Talbot 2215 !).

N. Kanara : Kudgi (Talbot 2311 !). Yellapur (Talbot 1524 !).

Ecology : Grows in large tufts on pasture ground especially on sandy soils.

Distribution : Tropics generally.

Economic uses : Cattle eat it up to the time of flowering; afterwards they do not seem to touch it. (Duthie).

Explanation of Plate 171 : *Chloris barbata* Sw.

1. Spikelet
- 2 Lower invol. glume.
- 3 Upper invol. glume.
4. Floral glume with palea.
- 5 Grain and styles.
- 6 and 7. Succeeding floral glumes.



CHLORIS BARBATA SW.

Delin: R. K. Bhide.

7. *CHLORIS MONTANA* Roxb.

Chloris montana Roxb. Hort. Beng. (1814) 82, Fl. Ind. I (1832) 329; Kunth Enum. Pl. I (1838) 265; Spreng. Neue Entdeck. III, 127, Steud. Syn. Pl. Glum. (1855) 204, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 369; Hook. f. Fl. Brit. Ind. VII (1896) 292; Acharyar S. Ind. Grasses (1921) 270, Haines Bot. Bih. and Or. (1924) 969.

C. decora Thw. Enum. 317 (excl. syn.).

C. barbata var. *decora* Trin. Cat. Ceyl. Pl. 109.

Etymology : *Montana* means mountainous, a habitat name.

Description : Perennial. Stems erect, tufted, geniculately ascending from a creeping base, rooting at the nodes, quite glabrous, 10 cm. to 1-2 m. high. Leaf-blades narrow-linear, finely acuminate, rounded at the base, glabrous, folded flat inwards, 1-20 cm. long, 1-5-3 mm. broad, sheaths shorter than the internodes, flat, compressed, glabrous, with a few hairs or none at the mouth and with membranous margins, uppermost sheath spathiform, enclosing the inflorescence when young; ligule a thin ridge of short hairs densely arranged. Nodes glabrous dark-ringed.

Spikes 2-6, very rarely up to 9, 2-5-7.5 cm. long, connate at the base, erect and never spreading. Peduncle slender, long, glabrous, but copiously pubescent just below the base of the connate spikes, rhachis angular, slender, scabrid. Spikelets about 3 mm. long excluding the awns, short-pedicelled, unilateral, bisinate, thin, slender, 1-flowered, pale or purple tinged, disarticulating above the 2 lower empty glumes which persist on the rhachis, generally 4-, rarely 3- or 5-awned, awns pale or purple, 3-5 mm. long, pedicel short, angular, scaberulous with a few pilose hairs, rhachilla produced, but is shorter than the flowering glume. Glumes usually 6, very rarely 5 or 7. Lower involucreal glume hyaline, awnless, white or lightly purplish, about 1.5 mm. long, lanceolate, finely acuminate, 1-nerved, and with a scabrid keel; upper twice as long as the lower, hyaline, oblong-lanceolate, finely acuminate or obtuse and shortly awned, 1-nerved. Lower floral glume broadly oblong, chartaceous, 3-nerved, bearded with long hairs along the margins from a little above the base and with a tuft of hairs at the base, awned at the apex; upper floral glume much smaller, cuneate, conduplicate, awned from the truncate tip, embracing glumes V and VI, glume V cuneate or subglobose, small, enclosing the still smaller or minute glume VI, both awned. Palea oblong, a little smaller than its glume, folded along the margins. Stamens 3, anthers pale yellow. Styles white with purple stigmas. Lodicules narrowly cuneate.

Locality : Deccan. Nasik (Lisboa).

Distribution : Upper and lower Gangetic Plain, southward to Ceylon, Coromandel Coast.

8. *CHLORIS QUINQUESETICA* Bhide

Chloris quinquesetica Bhide in Journ. and Proc. As. Soc. Beng. (new series) VIII (1912) 311, Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 759.

Etymology : *Quinquesetica* means having 5 setae or bristles.

Description : A glabrous, perennial grass, creeping and rooting at the lower nodes and there forming small tufts of leaves and an erect flowering stem 60 cm. high, nodes glabrous. Leaves 2-15 cm. long and 3-5 mm. broad, sparsely, delicately long-ciliate when young, ultimately glabrous, lanceolate, acuminate, truncate at the base, margins minutely scabrid, ligule a narrow imbricate membrane.

Spikes 5-18, 2.5-5 cm. long, crowded in a very short racemose fascicle the branches of which are often decurrent into the peduncle for a short distance and form ridges on it which are also studded with stray spikelets. Peduncle below the spikes and the rhachises hairy. Spikelets 8 mm. long including the awns. Glumes 7. I and II empty, III flowering, awned, paleate, IV-VII barren, epaleate, gradually smaller and rounder, all awned. Lower involucreal glume 1-5 mm. long, elliptic-lanceolate, membranous, strongly 1-nerved, slightly oblique; upper $1\frac{1}{2}$ times as long as the lower, elliptic-oblong, membranous, shortly mucronate, strongly 1-nerved. Lower floral glume without the awn as long as the upper involucreal, elliptic-obovate, cuneate, coriaceous, 3-nerved, and with a dorsoterminal awn 5 mm. long, lateral nerves densely bearded with long white hairs nearly from the base. Palea as long as the glume but narrower, slightly hairy at the back, very shortly 2-fid at the apex, 2-keeled, keels minutely ciliate. Stamens 3, styles 2, stigmas plumose. Grain plano-convex or trigonous. Lodicules minute.

Locality : Sind. Jamesabad, in fields (Sabnis B1116!).

Cutch. Bhuj, Bhodir Maka (Blatter 3748!), Runn of Cutch (Blatter 3732!).

Konkan. Versova (McCann A185!); Papadi, Bassem, growing on the bunds of ricefields, in semi-salt land (Bhide!), Colaba, near a swamp, very common (McCann A198! A199! A200!).

N. Kanara. Karwar, on red mud near the shore (Hallberg & McCann A197!).

Distribution : So far endemic.

* 9. *Chloris gayana* Kunth.

Chloris gayana Kunth Rev. Gram. I (1829) 89, 293, t. 58, Enum. I (1838) 267, Suppl. 216; Nees Fl. Afr. Austr. (1841) 240; Steud. Syn. Pl. Glum. I (1855) 207; Oliv. in Trans. Linn. Soc. 29, 174; Durand & Schinz Consp. Fl. Afr. V, 861.

C. abyssinica Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 406; Engl. Hochgebirgs Fl. Trop. Afr. 132; Schweinf. in Bull. Herb. Boiss. II, App. II, 32; Durand. & Schinz Consp. l. c. 860.

C. glabrata Anders. in Peters Reise Mossamb. Bot. 557.

Vernacular name : Rhodes Grass.

Description : Perennial or annual, 0.6-1.2 m. high; culms erect or geniculately ascending, or prostrate at the base, simple or branched, often emitting fascicles of barren shoots or short runners from the lower nodes, often robust, 3-9-noded, compressed below, glabrous, smooth, upper internodes usually exserted, sheaths glabrous or sparingly hairy near the mouth, smooth, the lower strongly compressed, keeled, keels sometimes scabrid, the uppermost sometimes tumid; ligules membranous, very short, long-hairy, blades linear, long-tapering to a fine point, 15 to more than 30 cm. by 6-8 mm. when expanded, flat or folded, glabrous or hirsute near the base, green, smooth below, rough above on the margins.

Spikes 6-15, umbelled, sessile, suberect, rarely spreading, 6-10 cm. long, greenish or brownish; rhachis scabrid; spikelets 3 mm. long, 3-4-flowered, shortly 2-awned, glumes very unequal, the lower involucrel ovate-lanceolate, acute, subhyaline, 1-1.5 mm. long, the upper oblong, obtuse, mucronate, 2-3 mm. long, firmer, scaberulous; lower floral glume oblong, subobtusely or acute, minutely 2-toothed, ciliate along the marginal nerves and shortly bearded below the tips or only finely bearded or almost glabrous, with a (sometimes minutely hairy) groove on each face; awn as long or slightly longer than the glume, straight, callus minutely bearded, palea glabrous, keels scabrid. Anthers 1.5 mm. long; second floral glume with a male flower, like the preceding, but glabrous, 2 mm. long, awn 2 mm. long or less; Vth and Vth glume rudimentary, cuneate in profile, empty, awnless.

Locality : Deccan : Poona (Burns!) See also Mann in Bull. 77, p. 72 of Dept. Agric., Bombay.

Ecology : The stems are prostrate at the base and often form stolons.

Distribution : S. and tropical Africa. Introduced in N. America, Australia, and the Hawaiian Islands.

92. *Eleusine* Gaertn.

Annual or perennial, leaves long, flat or folded, flaccid or firm

Spikes in interrupted spikes or the upper or all in a terminal umbel, straight, suberect, eading or deflexed; spikelets glabrous, 3-6-flowered, laterally compressed, densely imbricate, alternately biserial, unilateral, sessile on a flattened rhachis, the uppermost terminal, erect, rhachilla disarticulating above the involucrel glumes and between the flowering glumes, or tough, produced, sometimes terminating with a rudimentary glume. Flowers sexual. Involucrel glumes 2, subequal, persistent, obtuse or obscurely mucronate, membranous, strongly keeled, 3-5-nerved, the lateral nerves close to the keel, the lower shorter, with the keel crested. Flowering glumes very similar, 3-nerved near the base; lateral nerves submarginal above, with 1-2 short additional nerves close to the keel. Paleae slightly shorter than the glumes, 2-keeled, keels winged. Lodicules 2, minute, cuneate. Stamens 3. Ovary fibrous; styles slender from a broadened base, distinct, stigmas plumose, laterally exserted. Grain broadly-oblong to globose broadly grooved; pericarp loose, delicate, breaking up regularly or almost circumscissile; seed finely striate; embryo suborbicular, basal; hilum rectiform, basal.

Species 10.—Tropical and subtropical Africa and Asia, 1 widely spread through the tropics.

Of the 5 species mentioned by Cooke, 2 have been transferred to *Dactyloctenium* viz., *E. gyphocoma* and *E. aristata*. We add 2 species new to the Presidency: *E. verticillata* and *E. ovifolia*.

. Erect.

I. Spikes digitate.

1. Spikes slender, nearly glabrous at base. Seed oblong, obtusely trigonous. 1. *E. indica*.

2. Spikes stout, often incurved, pubescent at base. Seed globose 2. *E. coracana*.

II. Spikes scattered or whorled 3. *E. verticillata*.



ELEUSINE INDICA GAERTN.

B. Prostrate or creeping and rooting

- I. Ligule hairy Spikes digitate . . . 4. *E. flagellifera*.
 II. Ligule obsolete. Heads of spikes globose . . 5. *E. brevifolia*.

1. ELEUSINE INDICA Gaertn

PLATE 172.

Eleusine indica Gaertn. Fruct. I (1788) 8; Lamk. Ill. I, 203 t. 48, Kunth Enum. Pl. I (1838) 273, Suppl. 224, t. 16, fig. 4; Steud. Syn. Pl. Glum. (1855) 211, Roxb. Fl. Ind. I (1832) 345; Grah. Cat. Bomb. Pl. (1839) 235, Griff. Notul. III, 52, 53, Ic. Pl. Asiatic t. 119, fig. 156 & t. 150, fig. 1, Atchis. Cat. Panjab Pl. (1869) 168, Duthie Grasses N. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1888) 57, t. 69, Boiss. Fl. Or. V (1881) 555.
E. distachya Trin. ex Steud. Nom. ed. II, I (1840) 549.
E. distans Maench. Meth. (1794) 210.
E. domingensis Sieb. ex Schult. Mant. II, 323.
E. Goum., *inaequalis*, *rigidifolia* and *scabra* Fourn. ex Hemsl. Biol. Centr. Amer. III, 565.
E. gracilis Salisb. Prodr. 19.
E. marginata Lindl. in Mitch. Three Exped. I, 319.
E. tristachya Lamk. l. c., Kunth Revis. Gram. I (1829) 92, Enum. I (1838) 273, Hook. f. Fl. Brit. Ind. VII (1896) 293, Cooke. Fl. Bomb. II (1908) 1037; Acharyar. S. Ind. Grasses (1921) 273, fig. 206, Haines. Bot. Bih. and Or. (1924) 970.
Cynosurus indicus Linn. Sp. Pl. (1753) 72.
Panicum compressum Forsk. Fl. Aeg. Arab. (1775) 18.
Paspalum dissectum Knipf. Cent. Bot. in Orig. t. 11.
Triticum geminatum Spreng. Syst. I (1825) 326.
Agropyrum geminatum Schult. Mant. III, 655.
 Rheede Hort. Mal. XII, t. 69.

Vernacular names : Crowfoot grass, Crab grass, Mendla, Medha, Guder, Khurd-mendi.

Etymology : *Eleusine* is derived from *Eleusis*, where there was a temple of Ceres.

Description : Annual, erect; stem 30-60 cm. high, tufted, slightly compressed, glabrous; roots of strong fibres. Leaves distichous, flat or folded, as long as the stem, 3-6 mm. broad, linear, glabrous or sparsely hairy, with nearly smooth margins; sheaths compressed, the mouth not auricled but often with a few hairs, ligule a thin slightly hairy membrane.

Spikes 2-7 or more, 5-12.5 cm. long, with sometimes one or two detached spikes below the umbel, digitate, suberect or slightly recurved, the axils hairy and glandular, rachis flattened. Spikelets pointing forward at an acute angle with the rachis of the spike, variable in size, 2.5-4 mm. long, 3-6-flowered, glabrous. Involucral glumes unequal, membranous; lower 1-6 mm. long, ovate-oblong, acute, 1-nerved; upper 2-5 mm. long, ovate-oblong, subacute, very shortly apiculate, with 3-7 green nerves; floral glumes gibbously ovate-oblong, obtuse, 3-2 mm. long, palea shorter than the glume, oblong-lanceolate, subacute. Anthers 0.8 mm. long. Grain oblong, obtusely trigonous, obliquely striate, reddish brown.

Locality : *Cutch :* Bhuj Hill (Blatter 8549 !)

Khandesh : Umalla, Tapta bank (Blatter & Hallberg 5231 !), North slope of Chanseli (McCann A202 !).

Konkan : Byculia (McCann A207 !); very common in Bombay and Salsette Isls. (McCann !), Alibag (Ezekiel !), Vetora (Sabnis 33595 !); Bassein (McCann 4478 !).

W. Ghats : Khandala, very common (McCann 9407 !); Khandala to Karjat (Blatter & Hallberg 5323 !), Igatpuri (Blatter & Hallberg 5199 !).

Deccan : Poona (Woodrow).

S. M. Country : Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4988 !)

N. Kanara : Yellapur (Talbot 1523 !), Halyal (Talbot 2103 !); Nencholi, near banks (Talbot 954 !).

Ecology : A sporadic grass. Grows in large tufts on pasture ground and roadsides. Sedgwick thinks it is rather a companion of man.

Distribution : Throughout the plains of India, tropics of the Old World.

Economic uses : Considered to be a good fodder grass in some districts. Highly esteemed as a pasture grass in Australia and N. America.

Explanation of Plate 172 : *Eleusine indica* Gaertn.

1. Spikelet.
2. Lower invol. glume
3. Upper invol. glume.

4. Floral glume.
5. Palea.
6. Grain.

*2. ELEUSINE CORACANA Gaertn.

PLATE 173.

Eleusine coracana Gaertn. Fruct. & Sem. I (1788) 8, t. 1; Lamk. III. t. 28; Schreb. Gram. II, t. 35; Trin. Sp. Gram. Ic. t. 70; Panz. in Muench Denkschr. IV (1814) t. 8; Roxb. Fl. Ind. I (1832) 342; Grah. Cat. (1839) 235; Dalz. & Gibs Suppl. (1861) 97; Duthie Grasses N. W. Ind. (1883) 34; Fodder Grasses N. Ind. (1888) 57, t. 69; Field & Gard. Crops 15, t. 28; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 373; Hook. f. Fl. Brit. Ind. VII (1896) 294; Cooke Fl. Bomb. II (1908) 1039; Prain Beng. Pl. 1229; Haines Bot. Bih. and Or. (1924) 970.

Cynosurus coracanus Linn. Syst. ed. II, 875

Eleusine cerealis Salisb. Prodr. 19.

E. sphaerosperma Stokes Bot. Mat. Med. I, 149.

E. stricta Roxb. l. c. 343.

E. Tocussa Fresen. in Mus. Senkenb. II (1837) 141.

Rheede Hort. Mal. XII, t. 78.

Vernacular names: Korakan, Dagussa, Mandua, Marua, Ragi, Nachani, Nachni, Nagii, Ragi, Makra, Nanguh.

Etymology: *Coracana* comes from *kurakkan*, its Ceylon name.

Description: Very like *Eleusine indica*, but stouter, up to 1.5 m. high. Leaves often far overtopping the stem, 5-6 mm. broad; sheaths compressed, loose; ligule of hairs.

Spikes 4-7, suberect, with their ends or whole spike frequently incurved, rachis of spikes often pubescent at base, somewhat 3-gonous or back flattened. Spikelets much congested, awnless, 3-6-fid. Flowering glumes more broadly ovate than in *E. indica*, and often with 1-2 nerves in the sides, variable in size, up to 5 mm. long. Seed globose, dark brown, smooth in some varieties, in other cases somewhat rugose, with a depressed black hilum and slightly flattened on one side. A cultivated form of *E. indica*.

Locality: Extensively grown chiefly in the hilly districts of the Presidency. In the Kara and Ahmedabad Districts heavy crops are produced.

Ecology: It grows almost on any soil, rich and poor. See Watt III, 237-240.

Distribution: Cultivated in the tropics of the Old World for its seed.

Economic uses: The grain is eaten largely by the poor classes, it is not considered to be very wholesome. The straw is excellent fodder for cattle and is said to improve by keeping. "It is often said to be a good fodder. This is not my experience, the leaves though soft have very tenaceous vascular strands and I have noticed animals frequently reject them after chewing a few times." (Haines). A fermented liquor, called bojah or bojah, is prepared from grain in the Mahratta country. It is asserted that the grain is never attacked by insects.

Explanation of Plate 173: *Eleusine coracana* Gaertn.

1. Spikelet.
2. Dorsal view of palea showing the keels strongly winged.
3. Lower invol. glume.
4. Upper invol. glume.
5. Floral glume.
6. Palea.
7. Grain and styles.

3. ELEUSINE VERTICILLATA Roxb.

PLATE 174.

Eleusine verticillata Roxb. Fl. Ind. I (1832) 346; Aitchis. Cat. Panjab Pl. (1869) 168; Duthie Grasses N. W. Ind. (1883) 34; Fodder Grasses N. Ind. (1888) 58, t. 70; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 377; Hook. f. Fl. Brit. Ind. VII (1896) 295; Saxton & Sedgwick Plants of N. Gujarat in Rec. Bot. Surv. Ind. VI (1918) 322.

E. racemosa Heyne in Roth Nov. Sp. (1821) 80.

Aorachne eleusinoides Wight & Arn. in Wight Cat. no. 1760; Nees ex Steud. l. c.

A. verticillata Lindl. Introd. Nat. Syst. ed. II, 381.

Vernacular names: Chukhe, Kuri-chinke, Kanjan, Jaura.

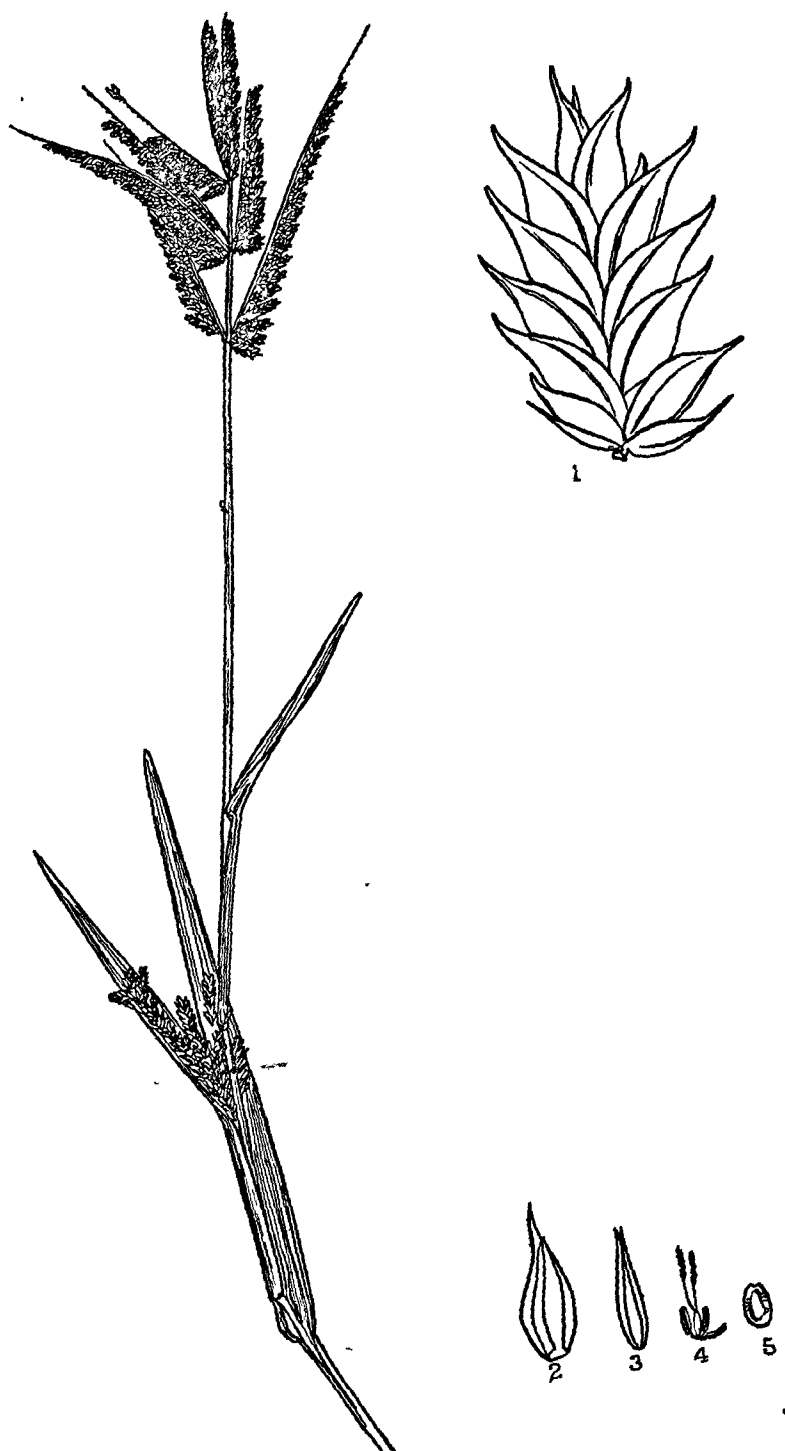
Etymology: This species is called *verticillata* because the spikes are arranged in verticels.

Description: An annual grass. Stems 30-90 cm. high, erect, stout or slender, simple or branched, soft. Leaves flat, rather broad, flaccid, acuminate, glabrous; sheath compressed; ligule a few hairs.



ELEUSINE CORACANA GAERTN. .

Delin: B. K. Bhida.



• ELEUSINE VERTICILLATA ROXB.

Delin: B. K.

Spikes few or many, scattered or whorled, or opposite or alternate, suberect, 2-7.5 cm. long, very many-flowered. Spikelets 4-6 mm long, 8-12-flowered, shining, glumes small, acute, glabrous. Involucral glumes broadly ovate, finely acuminate or aristulate. Flowering glumes 2 mm long, very broadly ovate, 3-nerved, keel excurrent, lateral nerves ending in small teeth. Grain rugose, pericarp caducous.

Locality : *Gujarat* Ahmedabad, compounds, lanes and banks, common (Saxton & Sedgwick !)

Ecology : A sporadic grass.

Distribution : Tropics of the Old World.

Economic uses : Said to be a good fodder grass for cattle.

Explanation of Plate 174 : *Eleusine verticillata* Roxb.

1. Spikelet
2. Floral glume
3. Palea.
4. Stamens, ovary and styles.
5. Grain.

4. ELEUSINE FLAGELLIFERA Nees.

PLATE 175

Eleusine flagellifera Nees in *Linnaea* XVI (1842) 220, Steud Syn Pl Glum (1855) 211; *Duthie Grasses* N W Ind. (1883) 34, *Fodder Grasses* N Ind. (1888) 57, t 37, Boiss Fl. Or. V (1884) 655, Hook f Fl. Brit. Ind VII (1896) 294, Cooke Fl Bomb II (1908) 1038

E. arabica Hochst ex Steud l c, Aitchis Cat Panjab Pl (1869) 167, Lisboa in Journ. Bomb. Nat Hist Soc VII (1893) 377, Watt Dict Econ Prod III (1890) 241

Etymology : *Flagellifera* means having *flagella*, alluding to the proliferous branching of the plant

Description : Perennial, prostrate, proliferously branched, glaucous, stems smooth, stiff, widely spreading, rooting at the distant thickened leafy nodes and sending up slender branches; internodes 10-20 cm. long. Leaves 1-3.5 cm by 1-6.3 mm, linear-lanceolate, acuminate, rigid, distant, flat or tortuous, recurved, the upper very short; sheaths glabrous; ligule a hairy line.

Spikes 3-6, digitate, 2-3.8 cm. by 4-8.5 mm, rachis slender, flaxuous, pubescent. Spikelets imbricate, subsessile or very shortly pedicellate, 4-6-flowered, 3-2-3.5 mm. long. Lower involucral glume rather less than 3-2 mm long, ovate, acute, membranous, upper involucral glume 4 mm. long, lanceolate, aristate, coriaceous, with broad membranous margins, floral glumes 5 mm long, ovate, acute, apiculate, chartaceous, 3-nerved, the midnerve compound, the margin membranous, hairy below, palea oblong with ciliate keels. Anthers 1-6 mm. long

Locality : *Sind* Jacobabad (Bhide !), Mirpurkhas (Jhaveri !), Sanghar (Sabnis B88 9! A236 !), Umarkot, sand hills (Sabnis B1002 ! B1017 !), Sehwan to Laki, foot of hills (Sabnis B616 !), Pad-Idan (Sabnis B511 !), Gharo (Blatter & McCann D605 !).

Cutch : Bhuj Hill (Blatter 3746 !).

Khandesh (Lisboa)

Deccan : Poona (Lisboa)

Ecology : Exclusively sand plants

Distribution : Punjab, W Peninsula, Afghanistan, N. Africa.

Economic uses : Good fodder for cattle and horses.

Explanation of Plate 175 : *Eleusine flagellifera* Nees.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol glume.
4. Floral glume.
5. Palea
6. Stamens, ovary and styles.

5. ELEUSINE BREVIFOLIA R. Br.

Eleusine brevifolia R Br. in Wall. Cat no. 8815; Hook. f. Fl. Brit. Ind. VII (1896) 294; Acharyar S. Ind. Grasses (1921) 274.

Koeleria brevifolia Spreng. Puggill. II, 21.

K. lagopoides Panz. ex Spreng. l c

Dactylis brevifolia Koen. ex Willd. Sp Pl I, 410 (each syn.), Roxb Fl. Ind. I (1832) 341.

D. cynosuroides Koen. ex Roth Nov. Sp. (1821) 74 (non Linn.).

Poa brevifolia Kunth Rev. Gram. I (1829) 111, Enum. Pl. I (1838) 324.

Deluropsis brevifolius Nees ex Steud. Nom. ed. II, I (1840) 30.

A. laevis Trin. Fund. Agrost. (1820) 143, t. 12.

A. pubescens Steud. Nom. l. c.

Eragrostis brevifolia Benth. in Hook. Ic. Pl. XIV, 51.

Triodia cynosuroides Spreng. Syst. Veg. I (1825) 331.

Etymology : *Brevifolia* means short-leaved.

Description : An annual grass. Stems creeping and spreading from the root, ascending from a decumbent base, generally slender and small, sometimes large and proliferously branched, leafy, 7-18 cm. long. Leaf-blade linear, acute with a subcordate or rounded base, 2-5 cm. long, 3-4 mm. broad, sheath compressed and glabrous; ligule a very short membrane, ciliate at the margin or obsolete.

Spikes usually many, sessile and crowded in globose heads, varying in diameter from 8-16 mm. Spikelets sessile, bisernate, ovate-oblong, 3-4 mm. long, 4-10-flowered. Involucral glumes membranous, ovate-oblong, acuminate, shortly awned, glabrous, the lower shorter than the upper, 1-3-nerved, the upper 3-5-nerved, and the nerves very close to the middle one in the keel. Lower floral glume and the succeeding ones ovate, cuspidately acuminate, 3-nerved, nerves villous below the middle and paleate. Palea oblong, lanceolate, truncate and minutely 2-toothed, keels villous below the middle. Anthers small. Lodicules small and cuneate. Styles long and slender. Grain orbicular to ovate, concavo-convex, red-brown, and transversely rugose.

Locality : S M Country Ranibennur (Bhide !)

Ecology : Exclusively a sand plant along the coast of the sea.

Distribution : Coremandel and Carnatic coasts.

93. DACTYLOCTENIUM Willd.

Annual or perennial, leaves flat, subflaccid; spikes in umbels of 2-6, erect or stellately spreading, tips of the rhachis barren, mucroniform, usually curved.

Spikelets 3-5-flowered, laterally compressed, densely imbricate, bisernate, sessile, unilateral on a flattened rhachis, the uppermost reduced; rhachilla tardily disarticulating above the empty glumes, tough between the flowering glumes. Flowers bisexual, the uppermost rudimentary. Involucral glumes 2, unequal, strongly keeled, the lower ovate, acute, thin, persistent, the upper elliptic-oblong in profile, obtuse, mucronate or awned, firm, deciduous. Flowering glumes ovate, subacuminate, 3-nerved, mucronate or awned, deciduous with the grains. Paleae about as long as the flowering glumes, 2-keeled, subpersistent. Lodicules 2, cuneate, minute. Stamens 3. Ovary glabrous; styles distinct, very long, subterminally exerted. Grain subglobose, slightly laterally compressed, not grooved or hollowed, rugose or punctate, pericarp very delicate, irregularly breaking away; embryo scarcely equalling $\frac{1}{2}$ the length of the grain; hilum basal, punctiform.

Species 5.—Warm regions.

- | | | | | | |
|-----------------------------|---|---|---|---|--------------------------|
| 1. Annual; grain subglobose | . | . | . | . | 1. <i>D. aegyptium</i> . |
| 2. Perennial; grain ovoid | . | . | . | . | 2. <i>D. indicum</i> . |

1. DACTYLOCTENIUM AEGYPTIUM Richt.

PLATE 176.

Dactyloctenium aegyptium Richt. Pl. Europ. I (1889) 68; Muschler Fl. Egypt I (1912) 108 (nomen attributum Willdenowio per error.).

Cynosurus aegyptius Linn Sp Pl. (1753) 72.

Dactyloctenium aegyptiacum Willd. Enum. Pl. (1809) 1029; Beauv. Agrost. (1812) 72, t. 15, fig. 2; Kunth Enum. Pl. I (1838) 261, Suppl. II, 204; Grah. Cat. Bomb. Pl. (1839) 235; Dalz. & Gibb Bcumb. Fl. (1861) 297; Arctchis. Cat. Panjab Pl. (1869) 167; Boiss. Fl. Or. V (1884) 556.

Eleusine aegyptiaca Desf. Fl. Atlant. I (1798) 85, Roxb. Fl. Ind. I (1832) 344; Griff. Notul. III, 51, Ic. Pl. Asiat. t. 139, fig. 79, Duthie Grasses N. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1888) 56, t. 35; Hook. f. Fl. Brit. Ind. VII (1896) 295; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 374; Prain Beng. Pl. 1229, Cooke Fl. Bomb. II (1908) 1038; Acharyar S. Ind. Grasses (1921) 276; Haines Bot. Bih. and Or. (1924) 970.

E. calata Rafin in Desv. Journ. Bot. IV (1814) 273.

E. cruciata Lamk. Ill. I, 203, t. 48, fig. 2.

E. mucronata Stokes Bot. Mat. Med. I, 150; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 376.



ELEUSINE FLAGELLIFERA NEES.

Delin: E. K. Bhide.



DACTYLOCTENIUM AEGYPTIUM RICHT.

E. pectinata Moench Meth. (1794) Suppl. 68.

E. prostrata Spreng. Syst. I (1825) 350.

E. radulans R. Br. Prodr. (1810) 186.

Dactyloctenium distachyum Bojer Hort. Mauriti. (1837) 370.

D. Figaret Notar. in Ann. Sc. Nat. Ser. III, IX (1848) 325.

D. meridionale Ham. Prodr. Pl. Ind. Occ. 6.

D. mucronatum Willd. l. c., Trin. Sp. Gram. Ic. t. 69.

D. prostratum Willd. l. c.

D. radulans Beauv. Agrost. (1812) 72; Kunthall. cc. 262, 204.

Cynosurus distachyus Retzl. ex Steud. Nom. ed. II, I (1840) 465.

Chloris mucronata Mich. Fl. Am. Bor. I, 59.

Cenchrus aegyptius Beauv. Agrost. (1812) 157.

Rhabdocola mucronata Beauv. l. c.

Aegilops saccharinus Walt. Fl. Carol. I, 249.

Rheede Hort. Mal. XII, t. 69.

Vernacular names : Gandhi, Anchi, Manchi, Tagar sammu, Hakki kalin hullu.

Description : Annual of variable habit, 30-45 cm. high, stems sometimes prostrate, rooting from the proliferously branched nodes, geniculate ascending, compressed, glabrous, smooth. Leaves linear, 2.5-12.5 cm. by 2-4 mm., tapering to a fine point, flat, glaucous, glabrous or hairy or hispidly ciliate with bulbous-based hairs; ligule a slightly ciliate line.

Spikes 2-6, digitately radiating, 1.3-3.8 cm. long; rachis trigonous or dorsally flattened, rigid, often excurrent into a pungent mucro. Spikelets many, 3-5-flowered, spreading at right angles to the rachis, up to 3.2 mm. long. Glumes divaricate; lower involucre glume ovate, acute, 2 mm. long; upper involucre glume 2 mm. long (excluding the awn), suborbicular, the midnerve produced into a usually curved awn often as long as or sometimes longer than the glume; floral glumes gibbously ovate, up to 3.2 mm. long, mucronate or awned; palea rather shorter than its glume, ovate-oblong, obtuse or 2-fid. Anthers about 1.2 mm. long. Grain subglobose, reddish, very rugose, 1 mm. diam.

Locality : Sind : Ghulamalla, garden (Blatter & McCann D599 !), Tatta (Blatter & McCann D600 !), Indus Delta (Blatter & McCann D601 !), Karachi (Bhude !); Mirpurkhas (Bhude !, Sabnis B1170 !), Umarnot (Sabnis B1001 !), Hyderabad, cultivated fields (Sabnis B50 !), Sukkur, cultivated fields (Sabnis B540 !); Nasarpur (Sabnis B1138 ! B1059 !), Sanghar (Sabnis B838 !)

Cutch Sumrasar (Blatter 3759 !), Bhuj Hill (Blatter 8551 !).

Gujarat Perim Isl., Gulf of Cambay (Blatter 3818 !)

Khandesh Murvat, Tapti Bank (Blatter & Hallberg 5164 !); Bor, Bor River (Blatter & Hallberg 5483 !).

Konkan Wada range, Thana Dist (Ryan 685 !), Juven (McCann 4264 !); Vetora (Sabnis 33592 !), Mulgaum (McCann A208 !); Versova (McCann A205 !); Uran (Hallberg & McCann 5135 !), Marine Lines, Bombay Isl. (Hallberg A206 !); very common in Bombay Isl. (McCann !), Ratnagiri (Woodrow 41).

W. Ghats Khandala to Campoli (McCann A209 !), Khandala (Gammie 15395 !, McCann !), Igatpuri (Blatter & Hallberg 5195 !, McCann !)

Deccan Poona (Jacquemont 399, 486), Agricultural College garden (Garade 665 !), Bopodi, near Poona (Gammie 15310 !); Manmad, river-bed (Blatter A211 !), Sharanpur, near Nasik (Woodrow).

S. M. Country : Yelvig, 1,800 ft., rainfall 25.30 in. (Sedgwick 2002 !); Gokak (Shevade !); Badami (Woodrow 12).

N. Kanara : Dandeli, 1,800 ft., rainfall 100 in. (Sedgwick & Bell 4215 !); Halyal (Talbot 2303 !), Karwar, seashore and near sea (Talbot 1298 !).

Ecology : A sporadic grass. Grows in barren places and fields in the drier parts of the Carnatic.

Distribution : Spread throughout tropical and subtropical regions.

Economic uses : Considered to be a very nutritious fodder grass for cattle, being both fattening and milk-producing (Duthie).—The grain is eaten by the poorer classes, especially at times of scarcity.

Medicinal uses : In Africa a decoction of the grain is well known as an alleviator of pains in the region of the kidney, and the herbaceous parts are applied externally for the cure of ulcers (Le Maout et Decaisne).

Explanation of Plate 176 : *Dactyloctenium aegyptium* Richt.

1. Spikelet.

2. Lower invol. glume.

3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

2. *DACTYLOCTENIUM SCINDICUM* Boiss.

Dactyloctenium scindicum Boiss. Diagn. ser. 2, fasc. 4 (1859) 131, Fl. Or. V (1884) 557.

Eleusine scindica Duthie Fodder Grasses N. Ind. (1888) 58; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 377.

Dactyloctenium glaucophyllum Courb. in Ann. Sc. Nat. Ser. IV, XVIII (1862) 133.

Eleusine glaucophylla Munro ex Benth. in Journ. Linn. Soc. XIX (1881) 107.

E. aristata Ehrenb. ex Boiss. Fl. Or. V (1881) 557; Hook. f. Fl. Brit. Ind. VII (1896) 296; Cooke Fl. Bomb. II (1908) 1039.

Vernacular names: Mandjiro, Bhobra, Bobriya.

Description: Perennial, slender, prostrate, proliferously branched; stem smooth, stiff, widely spreading, rooting at the distant thickened woody leafy nodes and sending up very slender branches 10-30 cm. long; internodes 5-10 cm. long. Leaves 2-5-10 cm. by 1-6-2-5 mm., acuminate or pungent, glaucous, sparsely hairy, and the margins ciliate with bulbous-based hairs; sheaths glabrous or sparsely hairy; ligule obsolete.

Spikes 3 or more, 6-13 mm. long, spreading or decurved, bearded at the base; rachis excurrent into a pungent point. Spikelets about 4 mm. long (including the awns). Lower involucre glume 2-5 mm. long, ovate, acute or apiculate, 1-nerved, with ciliate keel; upper involucre glume 3-2 mm. long (including an awn 0-8 mm. long), suborbicular; floral glumes nearly 4 mm. long, broadly ovate, acute, cuspidate, glabrous, keeled, membranous, with a strong midnerve and weak lateral nerves; palea broad, the keels scaberrulous. Anthers 1-2-3 mm. long. Grain ovoid, rugose.

Locality: Sind. Karachi (Burns !), seeds grown, taken from a bird's crop (Ticehurst !); Sanghar (Sabnis B893 !); Indus Delta (Blatter & McCann D602 !), Mirpur Sakro (Blatter & McCann D603 !), Gharo (Blatter & McCann D604 !); Mundgiro (Stocks 637).

Gujarat: Ahmedabad (Woodrow), dry open hills (Sedgwick !); Sevala (Chibber !)

Konkan: Ratnagiri (Woodrow)

Ecology: A sand plant.

Distribution: Punjab, Rajputana, W. Peninsula, Baluchistan, Afghanistan, Arabia, Nubia.

Economic uses: Considered to be a good fodder plant.

94. *DINEBRA* Jacq.

An annual leafy grass. Leaves flat.

Spikelets 2-3-flowered, 2-seriate, secund and umbricating on short slender spreading or deflexed spikes collected in narrow pyramidal racemes, not jointed at the base, rachilla slender, jointed at the base, produced beyond the flowering glumes and bearing an imperfect glume. Glumes 4-5, involucre glumes persistent, much longer than the floral, lanceolate, awned, 1-nerved, keeled, lower involucre glume shorter than the upper; floral glumes small, broadly ovate, subacute, hyaline, 1-nerved, palea hyaline, shorter than the glume, linear-oblong, obtuse with finely ciliate keels. Lodicules 2, minute. Stamens 3; anthers minute, didymous. Styles free, short, stigmas exerted at the apex of the glume, shortly penicillate. Grain narrowly ovoid, obscurely trigonous.

Species about 10.—India, Ceylon, Afghanistan, westward to the Mediterranean and tropical Africa.

Cooke describes one species. *Dinebra arabica*, which name has to cede to *Dinebra retroflexa* Panzer.

1. *DINEBRA RETROFLEXA* Panzer.

PLATE 177.

Dinebra retroflexa Panzer in Denkschr. Acad. Münch (1814) 270, t. 12; Boiss. Fl. Or. V (1884) 557; Muschler Fl. Egypt I (1912) 106.

Cynosurus retroflexus Vahl Symb. II, 20.

Dinebra arabica Jacq. Fragm. (1809) 77, Beauv. Agrost. (1812) 98, t. 16, fig. 2 (*Dinebra*); Duthie Grasses N. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1888) 55; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 372; Hook. f. Fl. Brit. Ind. VII (1896) 297; Prain Beng. Fl. 1230; Watt Dict. Econ. Prod. III (1890) 115; Cooke Fl. Bomb. II (1908) 1039; Acharyar S. Ind. Grasses (1921) 279; Haines Bot. Bih. and Or. (1924) 971.



DINEBRA RETROFLEXA PANZER

Delin R K Bhids.



TRIOGON PAUPERCULUS STAPF

Dehn: B

Leptochloa arabica Kunth Rev. Gram. I (1829) 91, Enum. Pl. I (1838) 271, Suppl. 221; Wight Cat. no. 1756, Aitchis. Cat. Panjab Pl (1869) 167.

Dynaea aegyptiaca Del. Fl. d'Eg. 25, t. XI, fig. 3.

Leptochloa calycina Kunth Il. cc. 91, 272; Dalz. & Gibs. Bomb. Fl. (1861) 297.

Eleusine calycina Roxb. Fl. Ind. I (1832) 346.

Dactylis paspaloides Willd. Enum. Hort. Berol. (1827) 111.

Vernacular names : Kahi kauli, Khana, Lona, Halligyan hullu, Halgyan hullu, Ululgyan hullu, Nari baluda hullu.

Etymology : *Dynaea* is the Arabic name of the species.—*Retroflexa*, which means bent back, refers to the spikes which are at last deflexed.

Description : Stems 30-90 cm. high, tufted, stout or slender, erect or geniculately ascending, leafy throughout, nodes glabrous. Leaves 7.5-20 cm. by 3-5 mm., linear, finely acuminate, flaccid, glabrous or sparsely hairy, contracted at the insertion; sheaths thin, loose, glabrous; ligule a narrow lacerate membrane.

Spikes 1.3-3.8 cm. long, racemously arranged along the axis of an inflorescence 10-30 cm. long, alternate, single or in fascicles of 2-3 together, rachis dorsally flattened, ventrally trigonous. Spikelets 5 mm. long (including the awns), alternate, sessile. Involucral glumes lanceolate, hyaline, keeled, with slightly recurved minutely scaberulous awns, the lower involucral glumes shorter than the upper; floral glumes reaching 2.5 mm. long, ovate-oblong, subacute, white. Anthers 0.6 mm. long. Grain ellipsoid-oblong, trigonous, 1.2 mm. long, pale brown.

Locality : Kathiawar Morvi (Woodrow)

Gujarat Banks of the Tapti above Surat (Dalzell & Gibson), Surat (Woodrow).

Khandesh Dadgaum (McCann A37 !); Dhuha, Mo'ti Tank (Chubber !), Antab, Bor, Bor River (Blatter & Hallberg 5147 !), Bor, Bor River (Blatter & Hallberg 5490 !), Bor, Tapti River (Blatter & Hallberg 5469 !), Tapti River, Bhusawal (Blatter & Hallberg 5157 !).

Konkan Bandra, damp fields at Khar (Vakil A35 !), Sion (McCann 5242 !); Parel (McCann 5104), Byculla (McCann A39 !)

Deccan. Deolali (Blatter A34 !), Sholapur (D'Almeida B36 !); Dhond, along the river (Bhude 1346 !), Bairawadi, Purandhar (McCann 5050 !), Poona (Woodrow), Agricultural College Farm (Ezekiel !).

S. M. Country. Dharwar Dist. (Sedgwick 2101 !); Kilgerry (Talbot 2623 !); Haveri (Talbot 2184 !).

N. Kanara. Yellapur (Talbot !).

Ecology : Very common as a weed of cultivation, growing near bushes around fields.

Distribution : India, Ceylon, Afghanistan, westward to Egypt and Senegal.

Economic uses : "It is probably nutritious, but being only an annual and not plentiful, it does not take a high place as a fodder grass" (Duthie). In Sind it is a favourite food of buffaloes.

Explanation of Plate 177 : *Dynaea retroflexa* Panzer.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

95. TRIPOGON Roth.

Slender densely tufted grasses, stems erect, leafy below. Leaves narrow, rigid, flat or convolute.

Spikelets usually many-flowered (all except 1-2 terminal perfect), 2-seriate and unilateral on a very slender terminal spike, not articulate at the base, rachilla produced between the glumes but not beyond them, slender, articulate at the base. Glumes many, involucral glumes unequal, distantly superposed, membranous, 1-nerved, lower involucral glume usually lodged in a furrow of the rachis, toothed or lobed on one side, upper involucral glume entire or notched below the mucronate or apiculate tip, floral glumes ovate, dorsally convex, 2-fid and awned in the cleft or 4-fid with the outer lobes awned, the inner lobes membranous and rarely awned, awns all straight, callus short, bearded; palea broad or narrow, complicate, truncate, with ciliate keels. Lodicules 2, cuneate. Stamens 3; anthers long, linear-oblong. Styles short, distant at the base, stigmas short, plumose. Grain narrow, free in the glumes.

Species about 13.—Tropical and subtropical Asia and Africa, one in America.

To the 4 species given by Cooke we add 3 others: *T. bromoides* Roth, *T. filiformis* Nees, and *T. Roxburghianum* Bhde.

A. Flowering glumes simply bifid with an interposed awn, the lobes awned or not.

I. Awn as long or longer than its glume.

1. Under 8 cm. high. Leaves 2-5 cm. long. Ligule membranous, ovate 1 *T. pauperculus*.
2. 15-45 cm. high. Cauline leaves 15-20 cm. long. Ligule a ridge 2. *T. capillatus*.

II. Awn shorter than its glume.

1. Lateral lobes of floral glume not awned.

- a. Leaves 30-60 cm. long. Spikelets 5-12-flowered. Lower involucrel glume 2 mm. long, lanceolate 3. *T. Lisboae*.
- b. Leaves 5-20 cm. long. Spikelets 10-20-flowered. Lower involucrel glume 3 mm. long with a projecting lobe at one side 4. *T. Jacquemontii*.

2. Lateral lobes of floral glume mucronate 5. *T. roxburghianum*.

B Flowering glumes 4-fid, outer lobes awned or not, inner membranous, sometimes very short or truncate.

I. Upper involucrel glume deeply notched or bifid at the apex 6. *T. bromoides*.

II. Upper involucrel glume minutely 2-toothed below the tip 7. *T. filiformis*.

1. *TRIPOGON PAUPERCULUS* Stapf.

PLATE 178.

Tripogon pauperculus Stapf in Hook. Ic. Pl. (1896) t. 2442 (*pauperulus* per err.); Hook. f. Fl. Brit. Ind. VII (1896) 285; Cooke Fl. Bomb. II (1908) 1036.

Etymology: *Tripogon* is derived from *treis*, three, and *pogon*, beard.

Description: Dwarf, 5-6.3 cm. high, annual, glabrous; stems capillary, densely tufted, leafy to the tip. Leaves setaceous, acute, 1.3-2.5 cm. long, involute; sheaths, the lowest lax, the uppermost close, striate; ligule membranous, ovate, obtuse.

Spikelets 2-3, remote (distant more than their own length from each other), or solitary at the apex of the stems, 8.5 mm. long (excluding the awns). Lower involucrel glume 4 mm. long, symmetrical, narrowly lanceolate, 1-nerved, very acute; upper involucrel glume 6 mm. long, lanceolate, cuspidately acuminate; floral glumes 4-1, with one or two empty above them, 5-6 mm. long (excluding the awn), linear-oblong, 3-nerved, the lateral lobes with capillary awns; median awn geniculate, twisted below the knee, nearly 13 mm. long; palea oblong with ciliate keels. Anthers 3, minute, subglobose. Grain narrowly linear, cylindric.—A dwarf species easily distinguished from the other species by its small size.

Locality: *W. Ghats*: Matheran (Woodrow!); Khandala, common on rocks (McCann A65! A66!); on the crest of the W. Ghats (1,800 ft.) 8 miles south of Lonavla on *Ficus glomerata* in company with mosses and *Utricularia orbiculata* (Woodrow 25); Mahableshwar, rocky summit of Sindola plateau (Sedgwick & Bell 4845!); Panchgani (McCann!); Castle Rock, on rocks (Bhde!).

Deccan: Near Karli on rocks (Woodrow!).

S. M. Country: Dudsagar (Talbot 2568!); Poondra (Talbot 4306!).

N. Kanara: On rocks on a hill near Nagangari, 2,600 ft., rainfall 100 in. (Sedgwick 2895!).

Ecology: This grass usually grows on rocks together with mosses and other small plants during the wet season. It also grows on hard gravelly soil. It is subgregarious. Flowers in September.

Distribution: Endemic in the W. Peninsula.

Explanation of Plate 178: *Tripogon pauperculus* Stapf.

1. Spikelet.
2. Lower invol. glume.



TRIOPOGON CAPILLATUS JAUB & SPACH

Desm: R. K. Bide.



TRIPOGON LISBOAE STAFF.

Delin. E. K

3. Upper invol. glume.
4. Floral glume.
5. Palea and lodicules.
6. Stamens, ovary and styles.

2. *TRIPOGON CAPILLATUS* Jaub. & Spach.

PLATE 179.

Tripogon capillatus Jaub. & Spach. III Pl. Or. IV (1850-53) 47, t. 332; Hook. f. Fl. Brit. Ind. VII (1896) 285; Cooke Fl. Bomb. II (1908) 1036, Haines Bot. Bih. and Or. (1924) 966.
T. capillatus (per error.) Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 371.

Etymology : *Capillatus* means having hairs, hairy, alluding to the tuft of hairs at the base of each flower.

Description : Whole plant 15-45 cm. high; stems densely tufted, erect or geniculately ascending, subfiliform, smooth. Leaves rigid, green, convolute, the radical leaves very short or reduced to sheaths, the cauline erect, elongate, 15-20 cm. by 3 mm., narrowly linear, finely pointed; sheaths glabrous, striate, ligule reduced to a ridge.

Spikes 12.5-30 cm. long, filiform or capillary, flexuous. Spikelets 3-4-flowered, distant (8 mm. apart or more) along the rachis of the spike, with many slender long awns. Involucral glumes lanceolate, thinly membranous, lower involucral glume 2.5 mm. long, cuspidately acuminate, upper involucral glume 5 mm. long (including a short awn); floral glume 4 mm. long, ovate-lanceolate, 2-cleft at the apex, the lobes slender, shortly awned, the median awn reaching 13 mm. long or more; palea as long as its glume, narrow, oblanceolate-oblong, hyaline. Anthers 1-6 mm. long—Easily identified by its pendulous form. Its delicate form and flaccid inflorescence distinguish it readily from the other species.

Locality : *Khandesh* : Toranmal, edge of plateau, 3,000 ft. (McCann A64 !).

W. Ghats : Khandala, common on trees and rocks (McCann A61 !, Garade !); Matheran, on trees (Woodrow !, Lisboa); Panchgani (Blatter & Hallberg B1247 ! B1288 !), Castle Rock, 1,800 ft., rainfall 300 in. (Sedgwick & Bell 4332 !)

Deccan : On trees about Poona (Jacquemont 580).

S. M. Country : Belgaum, on trees on Samboti Hill (Ritchie 866), Anmod, on trees (Talbot 2621 !).

N. Kanara : Sampkhand to Sirsi, on trees (McCann !).

Ecology : This species, as a rule, grows on trees and is occasionally found on rocks.

Distribution : Bihar, W. Peninsula, Mt. Abu.

Explanation of Plate 179 : *Tripogon capillatus* Jaub. & Spach.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, ovary and styles

3. *TRIPOGON LISBOAE* Stapf.

PLATE 180

Tripogon Lisboa Stapf in Kew Bull. (1892) 84, Hook. f. Fl. Brit. Ind. VII (1896) 286; Cooke Fl. Bomb. II (1908) 1036.

Tripogon sp. nov. Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 370.

Description : Perennial, 60-90 cm. high; stem stout or slender. Leaves 30-60 cm. by 4-8 mm., rigid, quite smooth, flat or convolute; sheaths glabrous, ligule obsolete.

Spikes 15-25 cm. long, narrow. Spikelets usually densely crowded, 4-13 mm. long, 5-12-flowered. Glumes coriaceous, involucral glumes very unequal, lower involucral glume 2 mm. long, lanceolate, acute, upper involucral glume 5 mm. long, linear-oblong, with a single tooth or unequally 2-toothed at the apex, floral glumes 3-2 mm. long, ovate, shortly 2-toothed at the apex; the lobes not awned, but with a slender awn about 0.8 mm. long from the sinus, palea oblong, obtuse, shortly 2-fid. Grain narrowly oblong, terete, glabrous.

Distinguished from *T. Jacquemontii* by its larger leaves and spikes

Locality : *Konkan* : Parsik Hill (McCann A337 !)

W. Ghats : Khandala, common on rocks (McCann A334 !, Bhide !); Panchgani, on Tableland (Blatter A338 !)

Deccan : Purandhar (McCann 5009 !); Karli, between Poona and Lonavla (Jacquemont 581).

Ecology : Generally growing on rocks overhanging watercourses and forming large tufts. A subreganous species.

Distribution : Mt. Abu, W. Peninsula.

Explanation of Plate 180 : *Tripogon Lisboa* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea and lodicules
6. Stamens, ovary and styles.

4. *TRIPOGON JACQUEMONTII* Stapf.

PLATE 181.

Tripogon Jacquemontii Stapf in Kew Bull. (1892) 85; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 370; Hook. f. Fl. Brit. Ind. VII (1896) 286; Cooke Fl. Bomb. II (1908) 1037; Haines Bot. Bih. and Or. (1924) 966.

Etymology : The specific name is commemorative of V. Jacquemont who travelled in India from 1828-32 and died in Bombay.

Description : Perennial, 30-60 cm. high. Leaves filiform, 5-20 cm. long, convolute, labrous.

Spikes 10-20 cm. long, narrow. Spikelets 8-20 mm. long, narrow, oblong, 10-20-flowered. Glumes subcoriaceous, the uppermost empty; involucrel glumes very dissimilar; lower involucrel glume 3-2 mm. long, acute, with a large projecting blunt tooth or lobe at one side extending half way up, upper involucrel glume 4 mm. long, lanceolate-oblong, acute; floral glume 4 mm. long, elliptic, shortly 2-fid at the apex, without lateral awns but with a median awn 1-2 mm. long. Grain narrowly oblong, terete, glabrous.

Sedgwick found specimens less than 8 cm. high near Dharwar.

Locality : Gujarat. Lasandra (Chibber!).

Khandesh: North slope of Chanseli (McCann A335!).

Konkan: Bombay district without precise locality (Lisboa).

W. Ghats: Matheran (Woodrow); Khandala (Blatter & McCann 3599!); Mahabaleshwar, west side of Plateau (Sedgwick!).

Deccan: Deolali (Blatter & Hallberg 4468!); Sholapur (Pinwill); near Ahmednagar (Miss Shatuck); Gangapur (Blatter & Hallberg A339!); Poona (Jacquemont 353, Woodrow); Agricultural College compound, Kirkee (Bhide!); Purandhar (McCann 5573!).

S. M. Country. Dharwar (Talbot 2301!), Belgaum (Talbot!); dry hillsides near Dharwar (Sedgwick 2896!).

Ecology : A subreganous species. Growing mostly on rocks. Common on barren uplands of the Carnatic, very common on the Fort wall at Dharwar.

Distribution : Bengal, Bihar, Central India, W. Peninsula.

Explanation of Plate 181 : *Tripogon Jacquemontii* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, grain, styles and lodicules.

5. *TRIPOGON ROXBURGHIANUM* Bhide.

Tripogon roxburghianum Bhide in Journ. & Proc. As. Soc. Beng. (new series) VII (1911) 515. *Lepturus Roxburghianus* Hook. f. Fl. Brit. Ind. VII (1896) 365 (*fortassis* Steudel).

Etymology : The specific name was given in remembrance of William Roxburgh (1750-1815), one of the greatest Indian botanists.

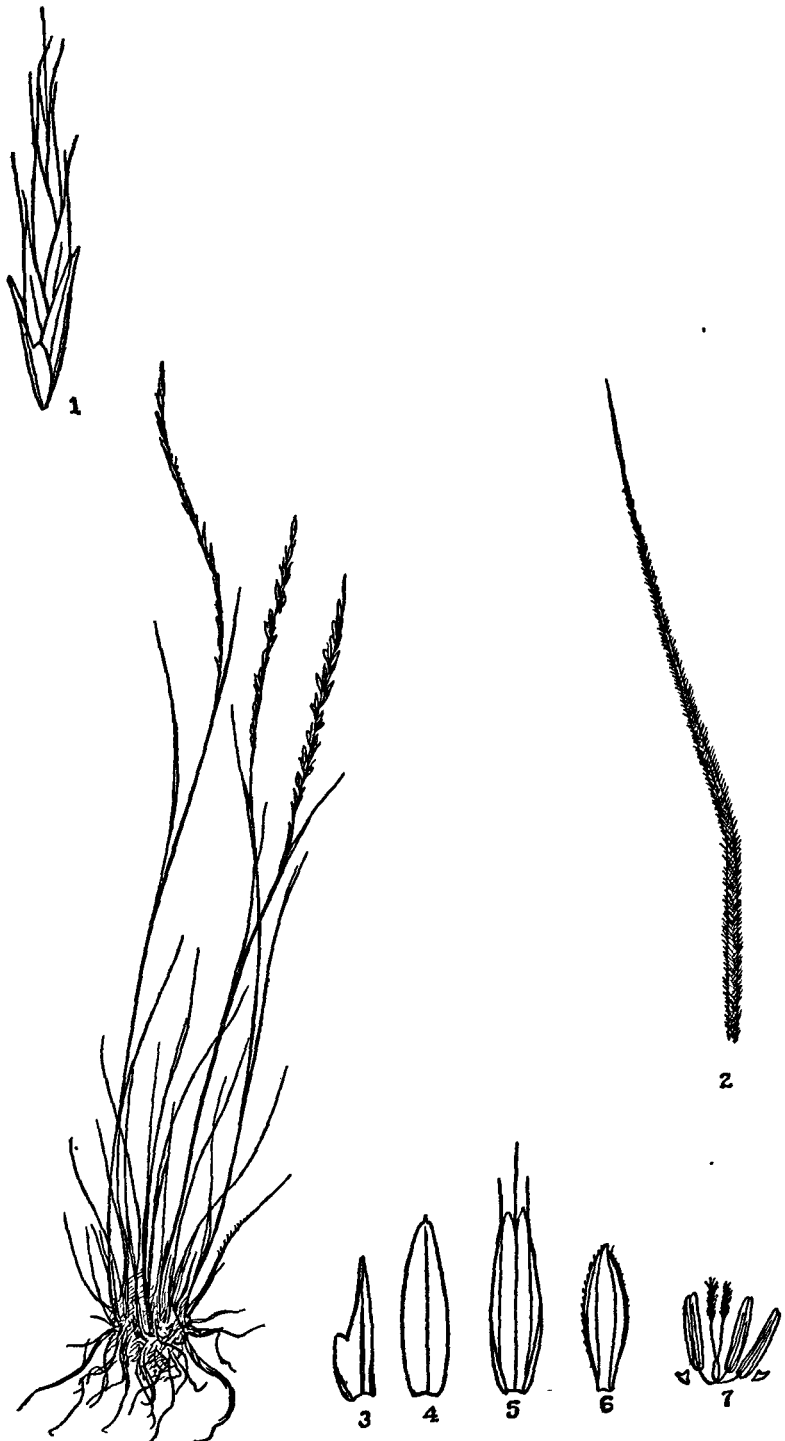
Description : 10-18 cm. high. Stems tufted. Leaves filiform, scarcely longer than 2.5 cm., ciliate with long hairs on the margin and at the ligule; sheaths glabrous, margins hyaline; ligule an oblong lacerated membrane.

Spike solitary, 5-6 cm. long. Spikelets 3 mm. long, 1-2-flowered, with the rhachilla jointed and produced beyond the upper flower and borne on a flattened rhachis, the internodes of which are alternately concave and convex. Lower involucrel glume hyaline, very oblique or slightly lobed on one side, broadly 1-nerved, remaining attached to the hollow in the rhachis when the spikelet is removed. Upper involucrel glume very coriaceous and thick, broadly 3-nerved,



TRIOPOGON JACQUEMONTII STAPF.

Detm. B. K. Bhide.



TRIPOGON BROMOIDES ROTH.

Delin :

about $2\frac{1}{2}$ times as long as the lower. Lower flowering glume a little shorter than the upper involucre, dorsally hairy in the lower part, membranous, 3-nerved, 2-toothed with a short mucro between, teeth also shortly mucronate. Callus bearded. Palea nearly as long as the glume, 2-keeled, keels minutely scabrid. Stamens 3. Styles 2, distinct, stigmas plumose. Grain terete. Lodicules 2, cuneate. Upper flower also bisexual or imperfect or 0. When complete it is like the lower.

Locality : Deccan : Chattarshuji Hill, Poona (Bhide !, Ezekiel !).

S. M. Country . Badami Fort (Bhide !); Dharwar, dry barren uplands, 2,400 ft. (Sedgwick !).

Distribution : So far endemic.

8. *TRIPOGON BROMOIDES* Roth.

PLATE 182.

Tripogon bromoides Roth Nov Sp. (1821) 79, Steud. Syn. Pl. Glum. (1855) 301; Stapf in Kew Bull. (1891) 85; Hook. f. Fl. Brit. Ind VII (1896) 287.

T. festucoides Jaub. & Spach Ill. Pl. Or. IV, 49, t. 333

T. lanatus Hochst ex Steud. l. c.

Plagiolytrum calycinum Nees in Proc. Linn. Soc. I, 95.

Avena mysorensis Spreng. Syst. I (1825) 337.

Etymology : *Bromoides* means resembling *Bromus*, a genus of grasses.

Description : Stems 15-45 cm. high, stout or slender. Leaves usually short, but sometimes as long as the stem, flat or convolute, and filiform.

Spikelets long or short, 7-20 cm. long. Spikelets very variable, 4-12 mm long, few- or many-flowered, close or distant. Lower involucre glume ovate or lanceolate, deeply notched on one side, membranous, nerve stout, upper oblong-lanceolate, deeply bifid, with a short awn in the cleft, membranous or coriaceous, with broad membranous margins. Lower floral glume and following bearded at the base, broadly ovate, strongly 3-nerved, 4-fid, outer lobes small, placed low down and margined with their awns half as long as the glume or longer, inner lobes often half as long as the glume, much larger than in any other species, awn rarely as long as its glume.

Locality : Deccan . Poona, Agricultural College Farm (Churka !); Katraj Ghat (Gammie !).

W Ghats . Mahabaleshwar, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4567 !), summit of Sindola plateau (Sedgwick & Bell 4841 !).

S. M. Country . Belgaum Fort, walls, 2,600 ft., rainfall 50 in. (Sedgwick 2950 !); from Belgaum southwards (*Teste* Hook. f.); Dharwar (Talbot 2301 !); Bijapur Dist. (Talbot 2929 !); Badami (Bhide !).

Distribution : W. Peninsula, Ceylon.

Explanation of Plate 182 : *Tripogon bromoides* Roth.

1. Spikelet.
2. Portion of leaf enlarged.
3. Lower invol. glume.
4. Upper invol. glume.
5. Floral glume.
6. Palea.
7. Stamens, ovary, styles and lodicules.

7. *TRIPOGON FILIFORMIS* Nees.

Tripogon filiformis Nees ex Steud. Syn. Pl. Glum. (1855) 301; Duthie Grasses N. W. Ind. (1883) 33, Hook. f. Fl. Brit. Ind VII (1896) 288, Collett Fl. Simlensis (1902) 619, fig. 196.

T. semitruncatus Nees et *T. unidentatus* Nees ex Steud. l. c.; Duthie l. c.

Plagiolytrum filiforme et *unidentatum* Nees in Proc. Linn. Soc. I, 95.

Catapodium filiforme Nees ex Duthie l. c.

Etymology : *Filiformis* refers to the filiform leaves.

Description : Stem 10-40 cm. high, very slender. Leaves filiform, as long as the stem. Spikes 4-25 cm. long.

Spikelets crowded, 4-10-flowered, 3-8 mm. long. Lower involucre glume ovate, broadly lobed on one side; upper narrowly lanceolate, sharply toothed on one or both margins near the tip. Flowering glumes 2-toothed at the tip, teeth acute or jagged, a long awn inserted in the cleft and a shorter awn on the outer side of each tooth, the glume thus being 3-awned, middle awn twice as long as the glume or longer.

Locality : Deccan . Wai (Talbot 4485 !).

S. M. Country . Belgaum (Talbot !).

Distribution : Temperate Himalaya, Khasia Hills, W. Peninsula.

TRIBE XIII: Pappophoreae.

Floral glumes broad, cleft into 3 to many, sometimes subulate lobes with or without alternating fine straight awns from the sinuses, usually many-nerved.

See key page xx.

96. ENNEAPOGON Desv.

Perennial grasses. Leaves narrow, often convolute; ligules reduced to a line of hairs.

Spikelets 3-flowered, in contracted or spike-like panicles; rhachilla disarticulating above the glumes; lowest floret hermaphrodite, the intermediate male or barren, the uppermost rudimentary. Involucral glumes persistent, membranous, acute, obtuse or minutely truncate, 3-9-nerved. Hermaphrodite floret: glume very broad, much shorter (excluding the awns), than the involucral glumes, 9-nerved, 9-awned, the awns subulate, equal or subequal, plumose, ciliate, or scaberulous, callus minute, short; palea ovate-oblong, 2-keeled. Lodicles 2, minute, cuneate, fleshy. Stamens 3. Ovary glabrous, styles distinct, short, stigmas laterally exerted, plumose. Grain oblong. Intermediate floret like the lower, but the floral glume shorter, glabrous, the ovary rudimentary or suppressed. Uppermost floret rudimentary or reduced to a tuft of hairs.

Species about 8.—In the dry warm regions of the Old World and in Australia; 1 species in Western N. America.

There is only 1 species in the Bombay Presidency.

1. ENNEAPOGON ELEGANS T. Cooke.

PLATE 183.

Enneapogon elegans T. Cooke in Cooke Fl. Bomb. II (1908) 1040.

Pappophorum elegans Nees in Wight Cat. no. 1771 (1833); Hook. f. Fl. Brit. Ind. VII (1896) 301; Steud. Syn. Pl. Glum. (1855) 199; Duthie Grasses N. W. Ind. (1883) 35.

Calotheca elegans Wight & Arn. ex Steud. l. c.

Etymology: *Enneapogon* is derived from *ennea*, nine, and *pogon*, beard, alluding to the 9-cleft floral glumes.

Description: Stem 7.5-45 cm. high, slender, wiry, erect or ascending from a subwoody, often thickened base, nodes often tomentose. Leaves 1.3-12.5 cm. long, usually convolute, pungently pointed, more or less softly pubescent, sheaths puberulous, ligule a line of hairs.

Panicles 2.5-7.5 cm. long, branches very short, rhachis villous. Spikelets with their awns up to 6 mm. long or more, sessile and pedicellate, softly tomentose, nearly white. Lower involucral glume 4 mm. long, lanceolate, acute, 5-7-nerved; upper involucral 5 mm. long, lanceolate, acute, 7-nerved; glume of hermaphrodite floret orbicular below, cleft above into 9 subulate awn-like lobes which are plumose in the lower half; palea ovate, 2-keeled, the keels pubescent.

Locality: Sind: Laki (Bhide !); Karachi Dist. (Woodrow).

Distribution: Peshawar, W. Peninsula, Burma.

Explanation of Plate 183: *Enneapogon elegans* T. Cooke.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea
6. Stamens, ovary and styles.

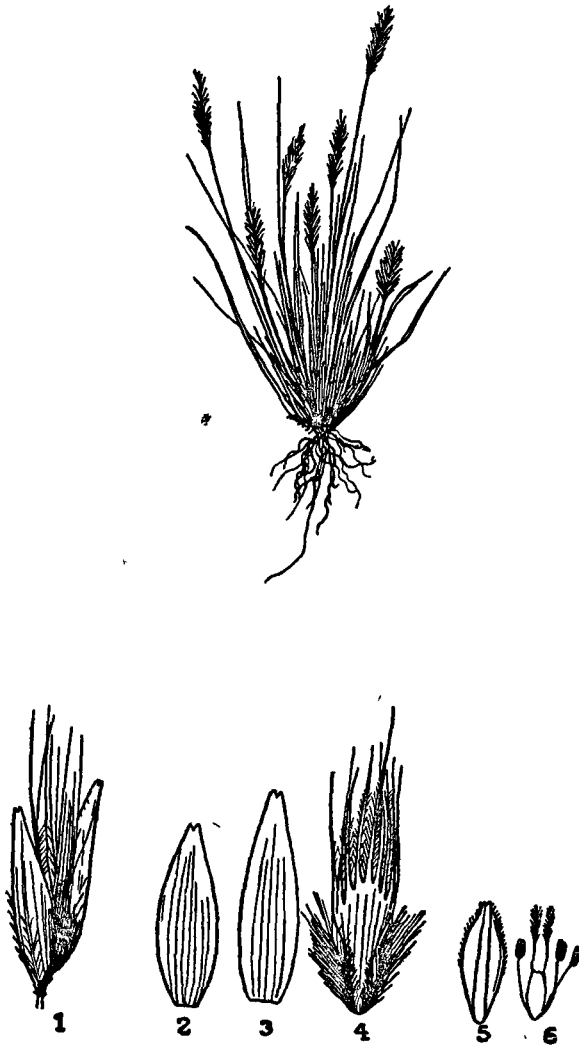
TRIBE XIV: Oryzeae.

Spikelets all alike or more or less heteromorphous and unisexual. Fertile floret 1, awnless, very rarely caudate-aristate, terminal with 2 minute empty florets (floral glumes) below it or solitary. Involucral glumes very minute or confluent into an annular rim or suppressed. Paleae 3-9-nerved. Stamens usually 6, rarely more or 3-1.

See key page xx.

97. HYGRORYZA Nees.

A floating glabrous grass; stems stoutish, diffusely branched, rooting in dense masses at the nodes, branches short, erect, leafy. Leaves oblong, obtuse.



ENNEAPOGON ELEGANS T. COOKE.

Delin: R. K. Bhide.



HYGRORYZA ARISTATA NEES

Delin: B K

Spikelets few, erect, 1-flowered, articulated on the pedicels, but tardily deciduous, long-awned, lanceolate on the few widely-spreading branches of a shortly pedunculate panicle. Involucral glumes 0, floral glume solitary, thinly chartaceous, narrowed to an erect scaberulous awn, strongly 5-nerved, the nerves scabrid and ciliate, the lateral nerves marginal; palea much narrowed, 3-nerved, acuminate, with ciliate keel. Lodicules minute, suborbicular. Stamens 6; anthers long, very slender. Styles 2, free; stigmas plumose, laterally exserted. Grain oblong, narrowed at the base, obtuse, free within the glume and palea.

Species 1.—India, Ceylon, Tonkin.

L. HYGRORYZA ARISTATA Nees

PLATE 184.

Hygroryza aristata Nees in Edinb. N. Phil. Journ. XV (1833) 380, Duthie Grasses N. W. Ind. (1883) 12, Fodder Grasses N. Ind. (1888) 20; Hook. f. Fl. Brit. Ind. VII (1896) 95.

Pharus aristatus Retz. Obs. V (1789) 23.

Leersia aristata Roxb Hort. Beng (1814) 26, Fl. Ind. II (1832) 207; Griff. Not. III, 3.

Zizania aristata Kunth Rev. Gram. I (1829) 8, Enum. Pl. I (1838) 10.

Z. Retzii Spreng. Syst. II (1825) 136.

Potamochoia Retzii Griff. Journ. As Soc Beng V (1836) 571, t. 24, fig. 2, Not. III, 8, Ic. Pl. Asiat. t. 139, fig. 147 & t. 140.

Pharus natans Herb. Russell ex Wall. Cat (1828) no. 8638.

Rheede Hort. Mal. X, t. 12.

Vernacular names : Deobhat, Urodhan.

Etymology : *Hygroryza* is derived from *hygros*, moist, and *oryza*, rice, therefore water rice.—*Aristata* means awned, alluding to the solitary glume.

Description : A glabrous floating grass, stem 30 cm. (and more) long, spongy, with feathery whorled roots at the nodes; internodes long or short. Leaves 2.5-7.5 cm. by 13-20 mm., linear or ovate-oblong, obtuse, more or less scaberulous above, smooth and glaucous beneath, subcoriaceous, with smooth or slightly scaberulous margins, base rounded or subcordate; midrib short; sheaths smooth, inflated, somewhat auricled at the mouth, compressed, with ciliate margins, ligule a narrow membrane.

Panicle about 5 cm long and broad, triangular; rachis and branches slender, stiff, smooth, the lower branches sometimes deflexed. Spikelets very narrow, 20 mm. long (including the awn), sessile or pedicellate. Floral glume about 1 cm long (excluding the awn), lanceolate, with 5 strong nerves, the lateral nerves forming thickened margins, hairy on the nerves outside, tapering into a long scaberulous awn as long as the body of the glume, palea as long as the glume.

Locality : Gujarat. Chikh (Woodrow).

Konkan Bhiwandi, near Kalyan (Chibber !); Nagotna (Gammie 16063 !); Kurnul, pond (Ezekiel !), bank of Vihar Lake (McCann !).

Deccan Poona, Agricultural College garden (Bhude !, McCann !).

Ecology : A floating grass, forming pure mats on the surface of the water.—Frequently mixed with *Pseudoraphis aspera* Pilger, but it is readily distinguished from the latter by its broader leaves. Specimens growing in water have fewer leaves on the portion above the water level. Specimens growing on the banks have many leaves, and the plant itself is much more robust.

Distribution : Of genus.

Economic uses : This grass is liked by cattle.—The grain is eaten by poorer classes.

Explanation of Plate 184 : *Hygroryza aristata* Nees.

1. Floral glume.
2. Palea.
3. Filaments, ovary and styles.

98. HOMALOCENCHRUS Mieg.

(*Leersia* Sw.)

Tall perennial slender marsh-grasses. Leaves narrow, flat.

Spikelets 1-flowered (the florets 2-sexual), in slender contracted usually flaccid panicles with very slender branches, articulate on the pedicels above the rudimentary glumes, strongly laterally compressed. Involucral glumes reduced to an obscure hyaline entire or 2-lobed rim; floral glume solitary, oblong, acute, awnless, thinly chartaceous, 3-5-nerved, the lateral nerves forming the thickened margins of the glume, the keel and margins pectinately ciliate; palea narrow, linear or linear-lanceolate, as long as the glume, rigid, 3-nerved, dorsally ciliate.

and with hyaline margins. Lodicules 2. Stamens usually 6 (rarely 3 or fewer). Styles short, distinct; stigmas plumose, laterally exserted from the glume. Grain ovoid or oblong, compressed, free within the glume and palea.

We follow O. Kuntze (Rev. Gen.) and Hitchcock (Genera of Grass, Unit. St. in U. S. Dept. of Agric. Bull. 772 (1920), 205) in going back to the genus *Homalocenchrus*. Hitchcock says that one species is referred to the genus with certainty, another being doubtfully referred to it. No specific names are used, but under the first there are two citations which appear in the Species Plantarum under *Phalaris oryzoides* Linn. which Hitchcock considers as type species.

Species 14.—Tropical and temperate regions.

Only one species in the Presidency.

1. HOMALOCENCHRUS HEXANDRUS O. Kuntze.

PLATE 185.

Homalocenchrus hexandrus O. Kuntze Rev. Gen. Pl. (1891) 777.

Leersia hexandra Sw Prodr. Veg. Ind. Occ. (1797) 131; Kunth Enum. Pl. I (1838) 6; Duthie Grasses N. W. Ind. (1883) 12, Benth. Fl. Austral. VII (1878) 549; Hook. f. Fl. Brit. Ind. VII (1896) 94; Cooke Fl. Bomb. II (1908) 1042, Haines Bot. Bh. and Or. (1924) 981.

Asprella hexander Roem. & Schult. Syst. II (1817) 267.

Leersia australis R. Br. Prodr. (1810) 210; Kunth l. c. 6.

Asprella australis Roem. & Schult. l. c.

Oryza australis A. Br. ex Schweinf. Beitr. Fl. Aethiop. (1867) 300; Aschers.-Schweinf. Ill. Fl. d'Eg. 167, no. 1148.

Leersia ciliata Roxb. Hort. Beng. (1814) 26; Duthie l. c., Fodder Grasses N. Ind. (1888) 21.

L. ciliaris Griff. Not. III, 2.

L. glaberrima Trin. Oryz. 7.

L. mexicana H. B. & K. Nov. Gen. et Sp. I (1816) 195.

Asprella mexicana Roem. & Schult. l. c.

Oryza mexicana Doell in Mart. Fl. Bras. II, II (1871) 10.

Zizania ciliata Spreng. Syst. II (1825) 136; Griff. Not. III, 1.

Oryza hexandra Doell in Mart. Fl. Bras. II, II (1871) 10.

Pharus ciliatus Retz. Obs. V (1789) 23.

Pseudoryza ciliata Griff. Ic. Pl. Asiat. t. 144, fig. 1.

Turraja nepalensis Wall. Cat. 8637D.

Blepharochloa ciliata Endl. Gen. 1352.

Hygoryza ciliata Nees ex Steud. Nomencl. ed. II, I (1841) 783.

Leersia brasiliensis Spreng. Nov. Prov. (1819) 47.

Asprella brasiliensis Roem. & Schult. Mant. II (1824) 153.

Leersia contracta Nees Agrost. Bras. (1829) 516.

L. luzoniensis Presl Rel. Haenk. I (1830) 207.

L. parviflora Desv. Opusc. (1831) 61.

L. abyssinica Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 356.

Asprella purpurea Bory Hort. Maur. (1837) 376

Leersia elongata Willd. Herb. no. 1511 ex Trin. in Mem. Acad. Petersb. 6, ser. III (1839) 172.

L. mauritanica Salzm. ex Trin. l. c. 174.

L. trimana Sieb. ex Trin. l. c. 174.

L. gracilis Willd. Herb. no. 1512 ex Trin. l. c. 173.

L. ferox. Fig. & De Not. in Mem. Ac. Torino ser. II, XIV (1833) 319.

L. Griffithiana C. Mill. in Bot. Zeitg. XIV (1856) 345.

L. capensis C. Mill. l. c. 345.

L. Gouani Fourn. ex Hemsl. Biol. Centr.-Am. Bot. III (1885) 514 (nomen).

Homalocenchrus Gouani O. Kuntze Rev. Gen. (1891) 777.

Leersia aegyptiaca Fig. & De Not. l. c. 317.

Etymology : *Homalocenchrus* is derived from *homals*, flat, perhaps alluding to the leaves, and *kenchros*, a kind of millet—*Hexandra* means having 6 stamens.

Description : Perennial; stems rooting in the mud, with floating flexuous branches 60-120 cm. long, sending up erect or ascending slender leafy branches 60-120 cm. high, usually slender and weak, smooth, striate; nodes hairy with deflexed hairs. Leaves 7-8-20 cm. by 3-8 mm., linear, tapering to a fine point, suberect, rather rigid, nearly glabrous, with scaberulous margins, base narrow; sheaths nearly smooth, glabrous, the margins eciliate; ligule short, obliquely truncate or 2-lobed, membranous.



HOMALOCENCHRUS HEXANDRUS O. KUNTZE

Delin: B. K. Bhide.



ORYZA COARCTATA ROXB.

Desm: B. K.

Panicle 5-10 cm. long, pedunculate, oblong, laxly branched, narrow; rhachis filiform; branches filiform, flexuous, angular, smooth. Spikelets nearly 4 mm. long. Floral glume nearly 4 mm. long, ovate-oblong, somewhat boat-shaped, acute, shortly mucronate, strongly keeled, ciliate on the keel and margins, 5-nerved, the lateral nerves forming a thickened margin; palea as long as the glume, linear-lanceolate, subacute.

Locality : *W. Ghats*. Castle Rock, in ricefield (Bhude !); Londa (Woodrow).

S. M. Country. Devarayi (Sedgwick & Bell 4463 !), Sadambi Tank, Tadas (Sedgwick 2052 !); Sluavar, in tanks (Sedgwick 2289 !), Kunnur, margin of tank (Sedgwick 4930 !).

N. Kanara : (McCann !), Halyal Tank (Talbot 1345 ! 2147 !).

Ecology : A gregarious grass. Common on the margins of tanks in the Mallad tract of the Carnatic, seldom absent from an old or natural tank.

Distribution : More or less throughout India, Ceylon, Africa, America, Australia.

Economic uses : Horses and cattle like this grass. See : Ordoveza, Ramon, C. The culture and cost of production of barit (*Homalocenchrus hexandra* Sw.) in Bay, Laguna, Philipp. Agric. 17 (1928) 137-47.

Explanation of Plate 185 : *Homalocenchrus hexandrus* O. Kuntze.

1. Spikelets on rhachis.
2. Floral glume.
3. Palea.
4. Stamens, ovary and styles.

99. *ORYZA* Linn.

Tall annual or perennial grasses. Leaves long, narrow, flat

Spikelets 1-flowered, loosely arranged on the branches of an elongate panicle disarticulating above the 2 lowest glumes. Glumes 5; the 2 lower involucrel glumes below the articulation of the spikelet minute, scale-like (rarely absent), the 2 next involucrel glumes above the articulation of the spikelet subulate, floral glume solitary, dimidiate-oblong, coriaceous or chartaceous, 5-9-nerved, awnless or with a short or long straight terminal awn; palea linear or lanceolate, as long as the glume, 3-5-nerved, coriaceous, with membranous margins. Lodicules 2, entire or 2-lobed. Stamens 6, anthers linear. Style short, free, stigmas laterally exserted from the glume. Grain narrowly oblong, compressed, closely covered by or adnate to the glume and the palea.

The spikelet of *Oryza* has been variously interpreted. Hook. f. has the following description. "Glumes 2-3, I and II much the smallest, empty, scale or bristle-like, rarely 0; III chartaceous, obtuse acute or awned, strongly 3-5-nerved, palea as long as the glume."

Cooke speaks of 5 glumes, "the 2 lower involucrel glumes below the articulation of the spikelet minute, scale-like (rarely absent), the 2 next involucrel glumes, above the articulation of the spikelet subulate, floral glume solitary, dimidiate-oblong, coriaceous or chartaceous, 5-9-nerved, awnless or with a short or long straight terminal awn; palea linear or lanceolate, as long as the glume, 3-5-nerved."

Stapf thinks that the usual 2 outer empty involucrel glumes are absent, that the next 2 (scales or bristles) are empty florets (valves). He also takes the IVth glume to be a palea.

Species about 17.—Tropical.—2 species in the Bombay Presidency

1. Ligule very short, scarcely longer than broad, fringed with short hairs 1. *O. coarctata*.
2. The lower ligules very long, up to 4 cm., always much longer than broad 2. *O. sativa*.

1. *ORYZA COARCTATA* Roxb.

PLATE 186.

Oryza coarctata Roxb. Hort. Beng. (1814) 87, Fl. Ind. II (1832) 206, Griff. Notul. III, 8, Ic. Pl. Asiat. t. 142, fig. 1, Hook. f. Fl. Brit. Ind. VII (1896) 93; Prain Beng. Pl. 1184;

Cooke Fl. Bomb. II (1908) 1042; Prodoehl. Oryzeae in Bot. Arch. I (1922) 232.

O. tritoides Griff. Notul. I c.

Sclerophyllum coarctatum Griff. l. c.

Etymology : *Oryza* is the Greek name for rice.—*Coarctata* means compressed, perhaps alluding to the pedicel which is contracted below the cupular tip.—Hamilton figures and describes the plant as having the inflorescence composed of smaller spikes appressed to the common axis in such a manner as to simulate *Triticum* or even *Lohum*. (Hamilton Icon. t. CXLH). This might be another explanation of the word *coarctata*.]

Description : Stem 1-2-1.8 m. high, erect from a stout creeping rhizome, smooth hard and polished. Leaves 15-38 cm. by 6-13 mm., coriaceous, linear, caudate-acuminate, with spinulose margins, sheaths glabrous, polished, reticulate like basket-work; ligule very narrow, fringed with short hairs.

Panicles 10-20 cm. long, spike-like, rachis and branches trigonous, stiff, smooth. Spikelets reaching 16 mm. long (including the awn). Glumes 5, the outer (below the articulation of the spikelet) consisting of 2 opposite minute appressed rounded or truncate thick scales, one attached lower than the other, the 2 glumes above the articulation of the spikelet subulate, the lower of the pair 2.5 mm., the upper 4 mm. long. Floral glume solitary, 16 mm. long, lanceolate, boat-shaped, rounded and with a large projecting wing on the back, cuspidate with a stout hard glabrous white awn about 4 mm. long, 7-9-nerved, the lateral nerve forming a thickened margin to the glume. Palea (upper floral glume of some authors) 13 mm. long, linear-lanceolate, cuspidately acuminate, with 5 strong nerves and hyaline margins. Lodicules large, membranous, subquadrate or trapeziform.

Locality : Sind - Karachi, in Herb. Kew without collector's name; covering large flats at the mouth of the Indus River (Blatter & McCann !); Shikarpur (Dr. King's collector); Keti (Blatter & McCann D666 !); after Keti (Blatter & McCann D665 !).

N. Kanara - Sulgeri (Sedgwick & Bell 4241 !).

Ecology : Evidently a sand plant in the vicinity of the sea. Forming dense mats and covering miles of flat land at the mouth of the Indus River within tidal influence, being covered at high tide. Common in the estuary of the Kala Nuddi (N. Kanara).

Distribution : Sundrains, W. Peninsula

Explanation of Plate 186 : *Oryza coarctata* Roxb

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea
6. Grain.

2. ORYZA SATIVA Linn.

PLATE 187

Oryza sativa Linn. Sp. Pl. (1753) 333; Gaertn. Fruct. II, 5, t. 80, fig. 5; Host. Gram. Austr. IV, t. 325, Roxb. Fl. Ind. II (1832) 200, Griff. Ic. Pl. Asiatic, t. 139, fig. 149; Duthie Grasses N. W. Ind. (1883) 12, Field and Gard. Crops 15, t. 4, Fodder Grasses N. Ind. (1888) 20; Hook. f. Fl. Brit. Ind. VII (1896) 92, Cooke Fl. Bomb. II (1908) 1043.

O. communissima Lour. Fl. Coch. (1790) 267.

O. glutinosa Lour. l. c. 267.

O. montana Lour. l. c. 267.

O. montana Ham. in Wall. Cat. (1828) 8633

O. praecox Lour. l. c. 267

O. perennis Mnch. Meth. (1794) 197.

O. palustris Hamilt. Prodr. (1796) 25.

O. latifolia P. Beauv. Agrost. (1812) 27 (non Desv.).

O. parviflora P. Beauv. l. c.

O. denudata Desv. ex Steud. Nomencl. ed. I (1821) 577.

O. elongata Desv. ex Steud. l. c.

O. marginata Desv. ex Steud. l. c.

O. mutica Lour. ex Steud. l. c.

O. pubescens Desv. ex Steud. l. c.

O. rubriarbus Desv. ex Steud. l. c.

O. emarginata Steud. Nomencl. ed. II (1841) 234.

O. pumila Host. ex Steud. l. c. 234.

O. rufipogon Griff. Not. III (1851) 5

O. glumaepatula Hochst. ex Steud. Syn. Pl. Glum. I (1854) 3.

O. nepalensis Don. ex Steud. l. c. 3.

O. repens Herb. Ham. ex Steud. l. c.

O. segetalis Russ. ex Steud. l. c.

O. sorghoides Desv. ex Steud. l. c.

O. caudata Trin. ex Doell. in Mart. Fl. Bras. II, 2 (1871) 8.

Vernacular names : Tasdala, Bhat, Chokha, Sari, Chauval, Dangar Bhatta, Nelli, Akki.

Description : Annual. Stems creeping or floating, 60 cm. to 3 m. high. Leaves 30-60 cm. by 6-8 mm. or more, striate, scabrous, 1-nerved; sheaths smooth; ligule long 2-partite,



ORYZA SATIVA LINN.

Delin; B K Bide.



Spikelets loosely panicle, not imbricating, awn 7-13 cm long, yellow or reddish, shining. Involucral glumes $\frac{1}{4}$ - $\frac{1}{2}$ the length of the floral glume, lanceolate, floral glume hispid above, dorsally spinescently ciliate, awn very long.

This is Hook. f.'s description prepared from the plant which Roxburgh and other Indian writers consider to be the indigenous Rice

For a note on the inflorescence see S. G. Bhalerao The Morphology of the Rice Plant and of the Rice Inflorescence In Journ of Ind Bot Soc V (1926) 13

Locality : The area occupied by Rice in 1922-23 was 1,885,602 acres Rice is chiefly confined to the Konkan and to the Deccan close to the W Ghats A fairly large area is also found in Gujarat, Thana, Kolaba, Ratnagiri and Kanara

For distribution, cultivation, economic and medicinal uses we refer to the following works :—

Watt G Dictionary of Economic Products of India V (1891)

Watt, G Commercial Products of India (1908)

Heuzé Les Pl. Aliment des Pays Chaudes (1899) 14-116.

Mollison Textb Ind Agric III (1901) 32-44.

Semler Trop Agrk III (1903) 1-48

Copeland, E B Rice (1924)

Winkler, H Reis Hamburg (1826)

Statistical Atlas of the Bombay Presidency (1925)

Diseases : See Butler, E. J.—Diseases of Rice—Agric. Res. Inst. Pusa Bull, 34 (1913).

„ „ „ The rice worm (*Tylenchus angustus*) and its control Mem. Dept. Agr India (Bot. Ser.) X (1919) 1

Explanation of Plate 187 : *Oryza sativa* Linn

1. Spikelet
2. Lower invol. glume.
- 3 Upper invol glume
- 4 Floral glume
- 5 Palea
6. Stamens, ovary and styles (Detail from an indigenous plant growing in a tank)

WILD RICES

We possess little reliable information regarding the Wild Rices of the Presidency. S. G. Bhalerao (in Agric. Coll. Mag. XX (1928) 45) has published a paper on "The Wild Rice (*Oryza sativa*) of the Bombay Presidency", which contains a number of interesting observations

According to him the wild type of Rice "occurs abundantly on the Western Ghats and occupies the zone where the rainfall is over 30-35 inches As an annual aquatic, it occurs in marshy areas, in small pools and ponds and on the margins of the big tanks It is rarely found in more than 3 feet depth of water and on land without and standing water as well"

We have found a Wild Rice in pools on Tableland at Panchgani (rainfall 60 in)

See also Schweinfurth, G. Ueber wild gesammelte Arten von Reis in Africa Ber Deutsch. Bot. Ges. 44 (1926) 165-67

Roy, S. C. A preliminary classification of the wild rices of the Central Provinces and Berar. Agr. Journ India XVI (1921) 365.

TRIBE XV: Festuceae.

Involucral glumes more or less resembling the floral glumes in general appearance Fruiting florets 2-many, very rarely 1, often much exserted from the involucral glumes Floral glumes 5- or more-nerved, very rarely 3- or 1-nerved, then neither with the side-nerves submarginal nor with the spikelets in 2-ranked spikes, awns, if present, terminal or subterminal, never kneed

See key page xx.

100. ELYTROPHORUS Beauv.

An annual, erect, glabrous grass Leaves very narrow, flat

Inflorescence of globose clusters of minute sessile spikelets crowded together in long continuous or interrupted catkin-like spikes (rarely on the short spike-like branches of a very contracted raceme). Spikelets short (many imperfect or reduced to empty glumes), strongly laterally compressed, not articulate at the base, 4-6-flowered; rachilla very short, articulate at the

base and between the flowering glumes, but not beyond the upper. Involucral glumes subequal, lanceolate, aristately acuminate, hyaline, 1-nerved, glabrous or ciliate, keeled; floral glumes rather longer, with a long awn, 3-nerved, with ciliate margins, the uppermost neuter; palea shorter than the glume, very broad, truncate 3-lobed, the lobes ciliate, keels distant, winged, smooth. Lodicules 2, obliquely oblong. Stamens 1-3; anthers minute. Styles free, long, stigmatic hairs very short. Grain minute, fusiform or narrowly oblong; pericarp loose at both ends.

Species 1.—Tropical Asia, Africa and Australia.

1. *ELYTROPHORUS ARTICULATUS* Beauv.

PLATE 188.

Elytrophorus articulatus Beauv. Agrost. (1812) 67, t. 14, fig. 7; Duthie Grasses N. W. Ind. (1883) 36, Fodder Grasses N. Ind. (1888) 61, t. 72, Lisboa Bomb. Grasses (1896) 117; Hook f. Fl. Brit. Ind. VII (1896) 306; Cooke Fl. Bomb. II (1908) 1044.
Echnalysium articulatum et strictum Trin. Fund. Agrost. (1820) 142.
Dactylis spicata Willd. in Ges. Naturf. Fr. Neue Schrift. III (1801) 416.
Sesleria spicata Spreng. Pugill. II, 21.
Elytrophorus spicatus A. Camus.

Vernacular names : Kemahi, Jungli rala, Chimansar, Poshe, Suria, Ket kapuri

Etymology : *Elytrophorus* is derived from *elytron*, a cover, and *phorein*, to bear, perhaps alluding to the palea.

Description : Annual, 15-60 cm. high, stems erect from a densely fibrous root, as thick as a crow-quill or less. Leaves longer or shorter than the stem, linear, acute, 2-5 mm. broad, smooth, flaccid, base narrow; sheaths membranous, loose, ligule small, membranous, lacerate.

Inflorescence 15-30 cm. long, often longer than the rest of the plant. Spikelets 5 mm. long (including awns), as broad as long. Lower involucral glume 2.5 mm. long; upper involucral glume 3.2 mm. long, floral glume (including awn) 5 mm. long, ovate-lanceolate; palea 2.5 mm. long, broadly oblong, truncate 3-lobed.

Locality : *Guyarat* · Godra (Woodrow)

Konkan · Alibag, ricefield near water works (Ezekiel !); Pen (McCann 5504 f 5509 !), Conditia (McCann 4242 !), Bhandup, in damp ricefield (Nana A46 !); Kalyan (Woodrow)

W. Ghats · Khandala, Bushy Lake, in dry bed (McCann 9392 !); Igatpuri (Blatter & Hallberg 5144 ! 5494 !); Matheran (Gammie 1664 !); Londa (Woodrow).

Deccan · Karjat, Honad Taluka (Bhonsle !).

S. M. Country · Chabbi, ricefield, 2,000 ft., rainfall 30 in. (Sedgwick 3705 !).

N. Kanara · Halyal (Talbot 1370 !).

Ecology : A sporadic grass. Grows in watercourses and ricefields.

Explanation of Plate 188 : *Elytrophorus articulatus* Beauv.

1. Lower invol. glume.
2. Upper invol. glume
3. Floral glume
4. Palea.
5. Stamen, ovary and styles.
6. Spikelets

101. *AELUROFUS* Trin.

Low much-branched very rigid perennial leafy grasses. Leaves distichous, short, strict, usually convolute, coriaceous, pungent.

Spikelets 6-many-flowered, minute, sessile, densely crowded in terminal villous heads, laterally compressed, not articulate at the base; rachilla obscurely jointed at the base, not produced beyond the upper glume; internodes very short. Glumes many, oblong, membranous, apiculate, the margins and tips broadly hyaline. Involucral glumes unequal, persistent; lower involucral glume narrowly oblong, 1-5-nerved; upper involucral glume much larger, 5-7-nerved from below the hyaline tip; floral glumes oblong, apiculate, 7-9-nerved; palea very large, broadly cuneate, 3-lobed, the lobes erose, flaps broad, keels nearly smooth or ciliate. Lodicules obliquely truncate. Stamens 3; anthers minute. Styles short, free; stigmas short, plumose. Grain oblong or obovoid, free within the glumes.

Species 5.—From the Mediterranean and Caspian regions to the Punjab, Sind, and S. India. —Only 1 species in the Bombay Presidency.

1. *AELUROPUS REPENS* (Desf.) Parl.

- Aeluropus repens* (Desf.) Parl. Fl. Ital. I (1848) 462.
A. villosus Trin. ex C. A. Meg. Verg. Pf. Cauc. (1831) 18; Hook. f. Fl. Brit. Ind. VII (1896) 334, Cooke Fl. Bomb. II (1908) 1045.
A. arabicus Steud. Nom. ed. 2, I (1840) 30.
A. brevifolius Wall. Cat. no. 8897, Duthie Grasses N. W. Ind. (1883) 39.
A. concinnus et sinuatus Fig. & Notar. in Mem. Acad. Torino ser. 2, XII (1852) 257.
A. lagopodioides Trin. ex Trin. Cat. Ceyl. Pl. 110.
A. littoralis var. *repens* Coss. & Dur. Expl. Sc. Alger. 155; Boiss. Fl. Or. V (1884) 594.
A. mucronatus Aschers. in Schweinf. Beitr. Fl. Aeth. (1867) 297.
A. mihacus Steud. Nom. ed. 2, I (1840) 30.
A. niloticus Edgew. in Journ. Linn. Soc. VI (1862) 196.
A. pungens C. Koch in Linnaea XXI (1848) 408.
A. repens Parl. Fl. Ital. I, 462.
Dactylis lagopodioides Dalz. & Gibs. Bomb. Fl. (1861) 298 (excl. syn.).
D. lagopodes Linn. Mant. (1767) 33; Roxb. Fl. Ind. I (1832) 341; Grah. Cat. Bomb. Pl. (1839) 236 (excl. syn.).
D. repens Desf. Fl. Atlant. I (1798) 79, t. 15.
Poa tunetana Spreng. Pug. II, 20.
Calotheca arabica, mihaca et repens Spreng. Syst. Veg. I (1825) 347, 348, Duthie l. c. (*per errorem mihacea*).
Festuca mucronata Forsk. Fl. Aeg.-Arab. (1775) 22.
F. pungens Vahl Symb. I, 319.

Vernacular name : Luni.

Etymology : *Aeluropus* is derived from *ailouros*, a cat, and *pous*, foot.

Description : Perennial, rigid, tufted, stems 7.5-20 cm. long, crowded on a woody root-stock with stout root-fibres, as thick as a crow-quill, simple or branched, smooth and polished; branches sometimes elongate, divaricate, 15-25 cm. long, resembling stolons, giving off branchlets at the nodes but not rooting, nodes glabrous, internodes short or long. Leaves 4-25 mm. long, narrowly lanceolate, acuminate, flat or convolute and subulate, erect or spreading, glabrous or sparsely ciliate, sheaths short, terete or inflated, glabrous or ciliate; ligule a shortly hairy ridge.

Heads of spikelets shortly pedunculate, subglobose or oblong. Spikelets reaching 3.2 m. long, 4-8-flowered, crowded, sessile, villous with soft hairs, pale green or white. Lower involucreal glume 2.5 mm. long, ovate-oblong, subacute, hairy and with ciliate margins, upper involucreal glume 3.2 mm. long, similar; floral glumes 3.2 mm. long, ovate, subobtusely apiculate, many-nerved, hairy and ciliate, the lower 2-4 sometimes neuter; palea broad, 3-lobed. Anthers 1.6 mm. long, oblong. Grain 0.6 mm. long, obovoid-oblong, dorsally compressed.

Locality : *Sind* - Near salt creeks in Sind (Stocks 506), Gharo (Blatter & McCann D659 ! D660 !); Mirpur Sakro (Blatter & McCann D658 !), Karachi (Bhide, Woodrow), Laki (Bhide !); Kotri, banks of Indus (Sabnis B370 !), Sehwan, clayey plains (Sabnis B606 !); Sehwan to Laki, foot of hills (Sabnis B108 !); Sanghar (Sabnis B891 !).

Cutch - Karie Roa (Blatter 3770 ! 3773 !); Kala Pachan Isl. (Blatter 3739 !); Runn of Cutch (Blatter 3730 ! 3731 !).

Kathawar - Porbandar (Bhide !).

Gujarat - Surat, mud-flats, mouth of Tapti River (Hallberg A29 !); Dharasana (Chibber !), road to Gola (Chibber !).

Konkan - On salt ground near the sea (Graham, Lisboa), Bandra, salt marsh (Vakil A28 !), Pen (McCann A31 !), Bassein Creek (Chibber !); Nagaon, Sion, salt marsh (McCann 5240 !), Salsette (Wight 53).

Ecology : Grows on salt ground near the sea, also on alkaline soils.

Distribution : Punjab, Sind, W. Peninsula, in salt ground, Ceylon, Afghanistan, Persia, Caspian region, Arabia, Mediterranean region.

102. *CENTOTHECA* Desv.

Tall leafy perennial grasses. Leaves broadly oblong or lanceolate, with trabeculate veins.

Spikelets 1-3-flowered, on the long spike-like branches of a lax subsimple panicle, not articulate at the base, laterally compressed, all perfect or 1 or more upper neuter; rachilla slender, articulate at the base and between the flowering glumes, not produced beyond the uppermost. Involucreal glumes distant at their insertions, ovate-oblong, persistent, empty, 3-5-nerved; upper involucreal glume larger than the lower; floral glumes broadly ovate, obtuse, apiculate, dorsally rounded, 7-nerved, naked or the upper usually bearing soft erect at length deflexed

tubercle-based spines or bristles; palea narrow, with ciliate keels. Lodicules 0. Stamens 2-3, anthers linear. Styles short, free; stigmas narrow, with short hairs. Grain ovoid, acute, terete, free within the glumes.

Species 4.—Tropical Africa, Asia, Australia.—One species in the Presidency

1. CENTOTHECA LAPPACEA Desv.

PLATE 189.

Centotheca lappacea Desv. in Nouv. Bull. Soc. Philom. II (1810) 189, Griff. Notul. III, 62, Ic.

Pl. Asiat. t. 152, fig. 1, Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 388; Hook. f.

Fl. Brit. Ind. VII (1896) 332, Cooke Fl. Bomb. II (1908) 1043.

C. latifolia Trin. Fund. Agrost. (1820) 141.

C. parviflora Anderss. in Peters. Reise Mosamb. Bot. 559.

Holcus latifolius Osbeck. Iter. 247, Linn. Syst. ed. X, 1305.

Melica lappacea Rasp. in Ann. Sc. Nat. Ser. I, V (1825) 443

M. diandra & refracta Roxb. Fl. Ind. I (1832) 327

Poa latifolia Forst. f. Prodr. 8.

P. malabarica Linn. Sp. Pl. (1753) 69; Burm. Fl. Ind. (1768) 27, t. 11, fig. 2

P. nemoralis Heyne ex Wall. Cat. no. 3826 A

Torresia byflora Roem. & Schult. Syst. II (1817) 515.

Uniola lappacea Trin. in Act. Petrop. VI, I (1831) 358

Cenchrus lappaceus Linn. Sp. Pl. ed. II, 1488

Festuca latifolia Roth Nov. Pl. Sp. (1821) 75

F. blepharophora Roem. & Schult. Syst. I c

F. ciliaris Heyne ex Roem. & Schult. I c

F. virgata Heyne ex Steud. Nom. ed. II, I (1840) 633.

Etymology : *Centotheca* is derived from *kentem*, to prick, and *theca*, a receptacle, alluding to the retrorse spines on the flowering glumes.

Description : A stout erect grass, stem 30-90 cm. high, erect from a woody rootstock with stout root-fibres. Leaves 10-25 by 2.5-3.2 mm., oblong-lanceolate, acute or acuminate, more or less unequal-sided, thin, smooth, glabrous or sparsely hairy, 9-11-nerved, base narrowed, sheaths usually glabrous except at the mouth, ligule a broad sometimes lacerate membrane.

Panicle 20-25 cm. long and broad, branches slender, suberect. Spikelets 5 mm. long, oblong-lanceolate, acute. Involucral glumes distant, lower 2.5-3.2 mm. long, ovate, acute, apiculate, 3-nerved; upper 3.2-4.3 mm. long, ovate-oblong, acute, apiculate, 3-5-nerved, lower floral glume 4-5 mm. long, broadly ovate-oblong, obtuse, apiculate, 7-nerved; upper floral glume about as long as the lower, oblong, obtuse, 7-nerved, finely apiculate, usually with 2 rows of tubercle-based ultimately deflexed bristles close to each margin in the upper part of the glume, sometimes naked, palea 2.5-3.2 mm. long, narrowly lanceolate, acute, with ciliate keels.

Locality : Konkan - Vetora (Sabnis 33564 ' 33727 ').

W. Ghats : Castle Rock, evergreen forests, 1,600 ft., rainfall 250 in. (Sedgwick 2714 ' Gamme 15693 ')

N. Kanara : Guddehalli, Karwar (Hallberg & McCann A25 '); Katgal (Hallberg & McCann A26 '), Devimane Ghat (Hallberg & McCann A27 '), on a fern stem (Woodrow!).

Ecology : Grows in shady evergreen forests. It is subgregarious.

Distribution : Himalayas, Khasia Hills, Central India, Burma, W. Peninsula, Ceylon, Malaya, China, Polynesia, tropical Africa.

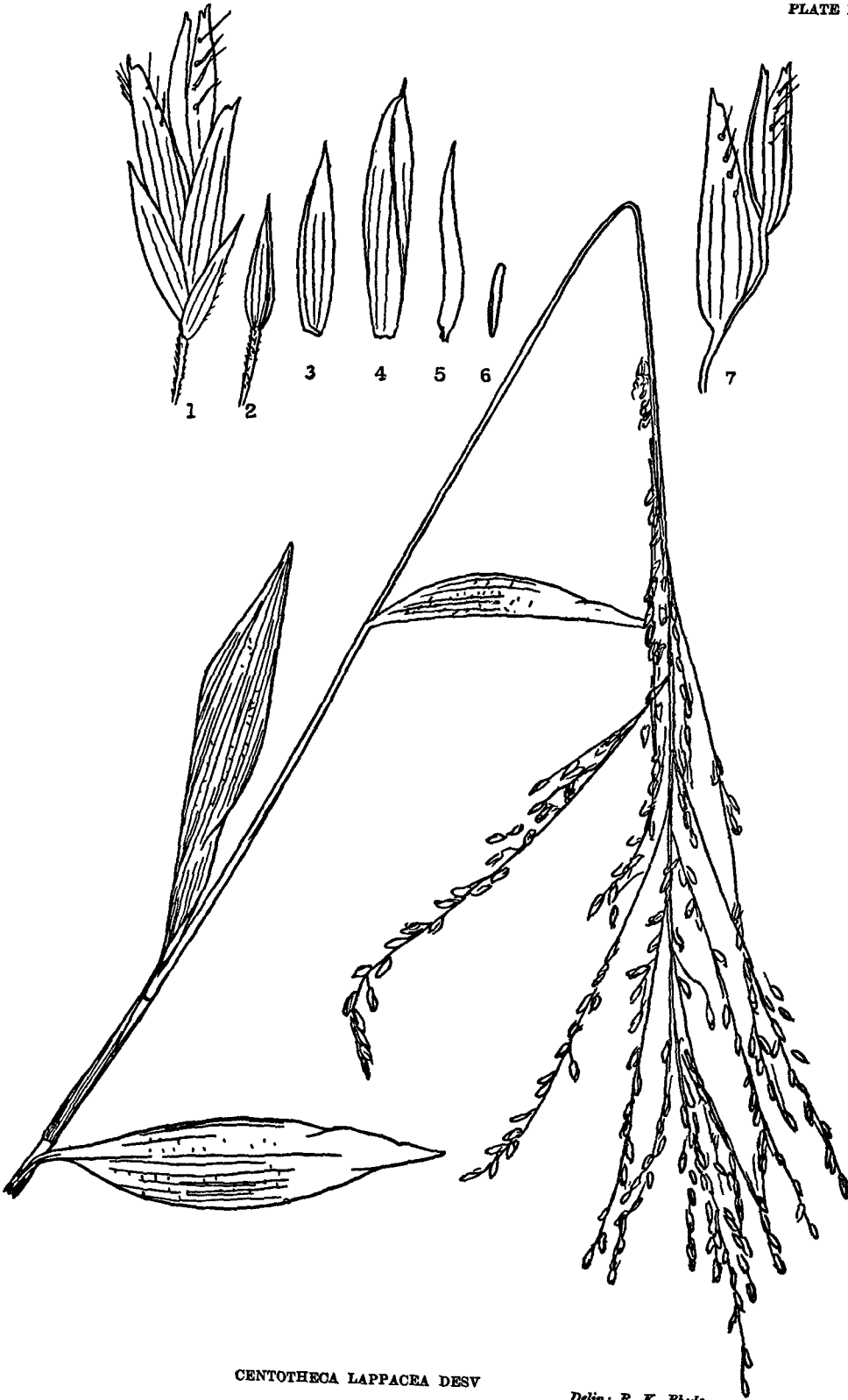
Explanation of Plate 189 : *Centotheca lappacea* Desv.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea
6. Grain

TRIBE XVI: Hordeae.

Spikelets sessile, singly or in clusters on the notches of a simple spike, sometimes partially sunk in hollows of the same. Florets 1 or more.

See key page xx.



CENTOTHECA LAPPACEA DESV

Delin. R. K. Bhale.

103. *LEPTURUS* R. Br.

Small, slender grasses. Leaves flat or convolute

Spikelets 1-2-flowered, sessile, solitary, half-immersed in hollows of the rachis of a simple, terminal, articulate or not-straight or incurved spike, with the back of the lowest floral glume opposite the rachis, rachilla jointed. Glumes 3 or 4. Lower involucrel glume minute or 0. upper longer than the flowering glumes, linear, rigid, acute, 5-nerved, erect or at length deflexed; flowering glumes much shorter than the upper involucrel glume, hyaline; palea 2-keeled. Lodicules 2, cuneate, or lobed. Stamens 1-3. Ovary glabrous, styles short, distant. Grain narrow or oblong, glabrous, free.

Species 6.—The Old World.—One species in the Presidency, new to it.

1. *LEPTURUS REPENS* R. Br.

Lepturus repens R. Br. Prodr. (1810) 207; Brongn. in Duperr. Voy. Bot. 57, t. 16, Kunth Enum.

Pl. I (1838) 463, Suppl. 374, Steud. Syn. Pl. Glum. (1855) 357, Benth. Fl. Austral. VII (1878) 668; Hook. f. Fl. Brit. Ind. VII (1896) 365.

Rotboellia repens Forst. Prodr. 9.

Monerma repens Beauv. Agrost. (1812) 117.

Lepturus aciculatus Steud. l. c. 357.

Lolium Coelorachis Forst. in Herb. Paris, Steud. Nom. ed. II, II (1840) 64.

Etymology: *Lepturus* is derived from *leptos*, slender, and *oura*, a tail, alluding to the spikes.

Description: A perennial grass. Stem elongate, woody, branched and widely creeping below. Leaves 7 to 15 cm long, 3-6 mm broad, spreading or erect, acuminate, glaucous; sheaths glabrous or mouth ciliate, ligule inconspicuous.

Spikelets shortly peduncled, fragile. Spikelets 2-fid, rachilla elongate, bearing an upper imperfect flower. Involucrel glumes 1 (or 2 in the uppermost spikelet) flat, rigid, 6-12 mm. long, closely appressed to the rachis, flowering glumes much shorter than the involucrel, elliptic, concave, 3-nerved. Palea 2-keeled. Lodicules fleshy, obliquely truncate or 2-lobed, glabrous. Grain oblong.

Locality: *N. Kanara* 4 miles from Halyal (Bhide).

Distribution: *N. Kanara*, Ceylon, Malay and Pacific Islands, Australia.

104. *TRITICUM* Linn.

Annual or perennial grasses with flat leaves.

Spikelets sessile, tumid, distichously spicate with their sides opposite recesses in the articulate or unarticulate rachis, solitary in the cavities. Glumes few, rigid, often unequal-sided; involucrel glumes empty, obtuse or shortly awned, few-nerved, persistent; floral glumes oblong or ventricose, dorsally rounded or keeled above, awnless or 1-3-awned, 5-9-nerved, lateral nerves not conniving with the central; upper flower male or neuter, palea with ciliate keels. Lodicules entire, ciliate. Stamens 3. Styles very short. Grain grooved ventrally, often hairy, free or adhering to the palea.

Species 20.—Eastern and Western Asia, Mediterranean, Europe.

*1 *TRITICUM AESTIVUM* Linn.

Triticum aestivum Linn. Sp. Pl. (1753) 86, Roxb. Fl. Ind. I (1832) 359, Grah. Cat. Bomb. Pl. (1839) 234, Dalz. & Gibb. Bomb. Fl. Suppl. (1861) 97.

T. sativum Lam. Fl. Fr. III (1778) 625, Duthie Grasses N. W. Ind. (1883) 45, Fodder Grasses N. Ind. (1888) 68.

T. vulgare Vill. Hist. Pl. Dauph. II, 153; Hook. f. Fl. Brit. Ind. VII (1896) 367.

Why the specific name *aestivum* has to be adopted has been explained by Hitchcock in Bull. 772, Unrt. States Dept. Agric. (1920) 89:

"Linnaeus describes seven species, *T. aestivum*, *T. hybernum*, *T. turgidum*, *T. spelta*, *T. monococcum*, *T. repens*, *T. caninum*. The citation in the Genera Plantarum is to Tournefort's figures 292 and 293 which represent, the first, beardless wheat, and the second, bearded wheat. These two forms, beardless and bearded, are named by Linnaeus *T. aestivum*, the bearded wheat, and *T. hybernum*, the beardless wheat. *Triticum aestivum* is chosen as the type because it has priority of position in the Species Plantarum. Linnaeus divides the genus into two groups, "*annua*" and "*perennia*." The latter group, including *Triticum repens* and *T. caninum*, is now referred to *Agropyron*."

Vernacular names: Wheat, Gahu, Godhi, Kanik.

Description: Tufted, annual grasses. Culms tufted, sheaths striate; ligule a lacerated membranous ring. Leaves glabrous or hairy on one or both surfaces.

Spike glabrous or hairy, awned or awnless; spikelets 2-ranked, compressed, parallel to the rachis, closely or loosely imbricate. Glume I keeled upwards; glume II sometimes paleate; glumes III and IV paleate and hermaphrodite, larger than V and succeeding glumes when present. Stamens 3; stigmas short and never protruded, ovary truncate and hairy on top. Grains in each spikelet, usually 3, the 2 lateral larger than the single terminal one (in examples when there are 4 grains in a spikelet the 2 lower ones are invariably larger than the upper 2), in shape they are oblong, swollen more or less according to the quality, with a groove on one face, blunt at both ends or pointed, surrounded by a hairy tuft.

Locality : The total area under wheat in 1922-23 was 1,526,344 acres, chiefly in Nasik, Dharwar, Ahmedabad, W. Khandesh, Ahmednagar and Belgaum. The total area in Sind at the same time was 405,401 acres.

VARIETIES.

We are not in a position and this is not the place to discuss the many varieties or races that are cultivated in the Presidency. We refer to some literature which may help those who wish to make further inquiries into this very complicated question.

Hackel in Engler & Prantl. Pflanzenfam. II, 80.

Murray in Watt, Dictionary of Economic Prod. VI, pt 4, 89.

Koernecke & Werner, Handbuch des Getreidebaues Bonn, 1815.

Howard, A. and Howard, G. L. C., The varietal characters of Indian wheats. Mem. Dept.

Agr. Ind. (Bot. ser.) II (1908), and many other papers on wheat which were mostly published by the Dept. of Agriculture in India (See Bibliography)

Schulz, A., Die Abstammung des Weizens, Mitt. natf. Ges. Halle a. S. I (1912) 14-17.

Percival, J., The wheat plant. a monograph. 463 p, 218 f. London 1921.

Huber, J. A., Ueber Abstammung und Systematik des Weizens. In Naturforscher III (1927) 577-582.

Diseases : See Butler, Fungi and Disease in Plants (1918).

105. HORDEUM Linn.

Erect annual, rarely perennial grasses. Leaves flat

Spikelets 1-flowered, 2-3-nate in the hollows or at the nodes of a simple cylindric spike, the lateral often imperfect; rachilla jointed at the base of the floral glume and produced above it with sometimes an imperfect glume. Glumes I and II empty, very narrow, rigid, persistent, the outer of each cluster of spikelets often together resembling an involucre, III dorsally rounded, 5-nerved above, narrowed into an erect or recurved awn; palea 2-keeled. Lodicules 2, ciliate. Stamens 3. Styles very short. Grain grooved in front, tip usually villous, adherent to the palea or free

Species 25.—Temperate regions of both hemispheres

*1. HORDEUM VULGARE Linn.

Hordeum vulgare Linn Sp. Pl. (1753) 84, Duthie Grasses N. W. Ind. (1883) 45, Fodder Grasses N. Ind. (1888) 69, t. F, fig 32, Hook f Fl. Brit. Ind. VII (1896) 371; Lisboa Bomb. Grasses (1896) 135

H. sativum Pers. Syn. I (1805) 108.

Vernacular names : Barley, Satu, Jave godhi, Jawa, Java satu, Kushuli satu, Sadhe satu.

*VAR. HEXASTICHON Aitch.

Var. hexastichon Aitch. Cat. Panj. Pl. (1869) 171

Hordeum hexastichon Linn. Sp. Pl. (1753) 85, Roxb. Fl. Ind. I (1832) 358; Grah. Cat. Bomb. Pl. (1839) 234; Dalz. & Gibs. Bomb. Fl. Suppl. (1861) 96.

Etymology : *Hexastichon* means 6-ranked, alluding to the arrangement of the spikelets.

Description : Height 75 cm. Roots woolly as in wheats. Culms membranous, tufted, stout, succulent; nodes waxy, concealed within the leaf-sheaths which are smooth, loose, strate, ligule membranous; base of leaf distinctly auricled; auricles subspirally lanceolate acuminate. Leaves sharply ascending, linear-lanceolate acuminate on both surfaces; midrib distinct, white; blades 23-30 cm long, 13-16 mm. broad.

Spike emerging from the inflated sheath of the flag, length with awns 15-20 cm., without awns, 5-7-9 5 cm.; spikelets 10 in each of the 6 ranks. Glume I, 15 mm. long; subulate, slightly awned, white hairy on base; glume II similar but awn 13 mm. long; glume III glabrous, bony, white, transparent, with 5 strong nerves which are slightly ciliate on the back; margins strongly

incurved, awn long, flattened, palea oblong, truncate, nerves 2, strong, green, not keeled, the glume and palea tightly enclosing the seed, lodicules obovate, long ciliate above, ovary cuneately obovoid, top densely hairy, stigmas short, white, plumose, included; stamens 3, anthers white short.

*VAR. *DISTICHON* Hook. f

Var. distichon Hook. f. Fl. Brit. Ind. VII (1896) 371

Hordeum distichon Linn. Sp. Pl. (1753) 85.

Etymology: *Distichon* means 2-ranked, referring to the arrangement of the spikelets.

Description: Height about 90 cm. Leaves scabrid on both surfaces, 15-25 cm long, by 6-13 mm. broad.

Spikes emerging from leaf-sheaths, 2-ranked, length with awns 18-20 cm., without awns 7.5-9 cm.; spikelets in each row 10 to 15, 2 rows of barren spikelets alternating with each row of fertile, surfaces smooth, barren spikelets with glumes I and II, slender, awned, about 13 mm. long, slightly exceeding III, which is linear-oblong, rounded at apex, ciliate, 5-nerved, palea slightly smaller; glume IV rudimentary, fertile spikelets with glumes I and II subulate, awned 1-nerved; glume III 5-nerved, palea 2-nerved both closely embracing the grain.

Locality of the two varieties. Not extensively grown in Bombay. Cultivated as a rabi crop in Sind, Ahmedabad, Kaira, Panch Mahals, Satara, Sholapur, Poona and Ahmednagar.

For further and fuller information we refer to—

Watt, Dict. Econ. Prod. 4 (1890) 274

Koern. & Wern., Handbuch des Getreideb. II, 600

Schulz, A., Die Abstammung der Saatgerste, *Hordeum sativum*. Mitt. Natf. Ges. Halle a. S. I (1912) 18-27.

Wiggans, R. G., A classification of the cultivated varieties of Barley. Cornell Agr. Exp. Stat. Mem. 46 (1921) 365-456.

Blaringhem, L., Sur les caracteres d'especes elementaires d'Orges (*Hordeum*). Bull. Soc. Bot. France 71 (1924) 623-27.

TRIBE XVII: Bambuseae.

Shrubs or trees, rarely perennial herbs. Blades flat, many-nerved, articulated on the sheath. Spikelets all of one kind. Florets few to many, rarely 1. Involucral glumes distinct or indistinctly differentiated, *i.e.*, passing below into more or less numerous bracts and sometimes having like them flowering branchlets or spikelets in their axil, and at the same time resembling the floral glumes. Floral glumes subherbaceous to subcoriaceous, 5-many-nerved, generally awnless. Lodicules usually 3. Stamens 3, 6 or more. Styles 2 or 3.

See key page xxi.

106. BAMBUSA Schreb

Shrubs or trees, usually large and caespitose (rarely climbing); stem-sheaths broad, the blade often triangular. Leaves shortly petiolate, not tessellate by nervules but sometimes so by pellucid glands; sheaths variously awnless.

Spikelets 1-flowered, usually arranged in a large leafless panicle bearing heads or spiciform branches, or in leafy panicles, or in paniculate spikes. Lower glumes 1-4, empty or bulbiferous; flowering glumes ovate-lanceolate, the uppermost imperfect; palea 2-keeled. Lodicules 2 or 3, membranous, obovate, rarely obsolete. Stamens 6, free. Ovary oblong or obovoid, with a hairy tip; styles short or long; stigmas 2-3. Grain oblong or linear-oblong, furrowed on one side; pericarp thin, adherent to the seed.

Species 73.—Eastern Asia, Australia.—One species indigenous in the Presidency, and 2 commonly cultivated.

I. Stem and branches unarmed.

1. Spikelet subcylindric; fertile flowers 5-9 1. *B. nana*.

2. Spikelet compressed, flattened, distichous, fertile
flowers 5-6 2. *B. vulgaris*.

II. Stem and branches armed 3. *B. arundinacea*.

*1. BAMBUSA NANA Roxb.

Bambusa nana Roxb. Hort. Beng. (1814) 25, Fl. Ind. II (1832) 190; Munro Monogr. Bamb. in Transact. Linn. Soc. XXV (1866) 89; Gamble Ind. Bamb. Ann. Roy. Bot. Gard. VII (1896) 40, t. 38; Brandis Ind. Trees. 669; Camus Bambusées (1913) 121, pl. 37, fig. B.

B. glaucescens Siebold Cat. ex Munro.

B. glauca Lodd Cat.

B. caesia Sieb. & Zucc. ex Munro

B. sterilis Kurz. in Miquel Ann. Mus. Bot. Lugd. Bat. II, 285

B. viridi-glaucescens Carrière in Revue Hort. (1869) 292 (non Riv.).

B. aurea Franchet & Savatier (non A. & C. Rivière).

Ischurochloa floribunda Buse in Miq. Pl. Jungh. 390; Miquel Fl. Ind. Bat. III, 422.

Arundinaria glaucescens P. Beauv. Agrost. (1812) 144; Ruprecht in Act. Acad. Caes. Petrop. (1840) 23, t. 1, fig. 3; Munro Monogr. I. c. 22.

Panicum arboreascens Linn.

Triglossum arundinaceum Fisch. apud Roem. & Schult. Syst. (1817) 846.

Ludolfia glaucescens Willd. in Mag. Gesell. N. F. Berlin (1808) 320.

Vernacular names: Dwarf Bamboo, Bank bambu.

Etymology: *Bambusa* was formed from its Malayan name.—*Nana* means dwarf.

Description: Stems densely tufted, 2-3 m. high, rarely more, 3 cm. in diam., glabrous, green when young, then yellow, unarmed, hollow, much branched from the base; branches fascicled, semiverticillate, often dichotomous. Sheaths of young shoots glabrous, striate, very long, attenuate, apiculate, lanceolate, truncate at the apex, surmounted by an imperfect limb rather long-acuminate and decurrent into 2 ciliate auricles. Leaves often small, 2.5-7.5 cm. long, the larger ones often attaining 14 cm. by 5-7 mm., rounded at the base, long-acuminate, smooth or pubescent below, scabrous on the margins, glaucous-bluish, secondary nerves 5-7 pairs, not tessellate, but provided with pellucid glands.

Spikelets 12-45 mm. long, few, clustered or solitary on the branches of short diffuse panicles, straw-coloured, shining, 5-9-flowered; sometimes with bractiform subfoliaceous scales at their bases; rachilla glabrous, flattened. Glumes all flowering or rarely the lowest empty, ovate, acute, many-nerved. Palea shorter than the glumes, keels minutely ciliate at or near the tip only. Stamens long-exserted, pendulous; anthers obtuse or finely apiculate, yellow. Ovary obovoid, pubescent at the apex. Style very short, divided from almost the base into 3 long and hairy stigmas. Grain elliptic, furrowed, shortly beaked, top hairy.

Locality: Cultivated in gardens.

Distribution: China, Japan.—Cultivated in Manila, Luzon, Java, Malay Peninsula, India, Europe.

Economic uses: Makes good hedges.

*2. BAMBUSA VULGARIS Schrad.

Bambusa vulgaris Schrad. apud Wendl. Collect. Pl. II (1810) 26, t. XLVII; Rupr. in Act. Acad. Caes. Petrop. (1840) 137, t. XI, fig. 47; Munro Monogr. 107; Bedd. Fl. Sylv. CXXXII; Brandis Ind. Trees 670, A. & C. Rivière Les Bambous 191; Gamble Ind. Bamb. 43, pl. 40 and in Hook. f. Fl. Brit. Ind. VII (1896) 391, Camus Les Bambusées (1913) 122, pl. 76, fig. A

B. Thourau Kunth Not. Gen. Bambus. in Journ. Phys. (1822) 148; Rupr. Bambus. 48, t. XI, fig. 48.

B. surinamensis Rupr. in Act. Acad. Caes. Petrop. (1840) 49, t. XI, 49.

B. Sieber Griseb. Fl. Brit. W. Ind. (1864) 528.

B. arundinacea Moon Cat. 26; Art. Hort. Kew. ed. II, 316.

B. auriculata Kurz apud Houz. de Lehais.

Vernacular names: Kulluk, Udha-bans, Yellow bamboo

Description: Stems unarmed, 6-15 m., 5-10 cm. in diam., first green, then yellow, or striped, polished; nodes hardly raised, with usually a ring of brown hairs; internodes 25-45 cm. long, walls rather thin. Stem-sheaths 15-25 cm. by 17-23 cm., often streaked with yellow, thickly hairy above, top rounded, retuse, blade 5-15 cm., appressed hairy on both surfaces, base rounded, decurrent with rounded, falcate, fimbriate auricles; ligule broad, toothed or fimbriate. Leaves linear-lanceolate 15-25 cm. by 16-40 cm., pale, petioled, glabrous, tessellate by pellucid glands, tip twisted, scabrid, nerves 6-8; sheath laxly hairy; ligule short, ciliate, auricle rounded.

Panicle large, leafy. Spikelets 15-20 mm., in bracteate clusters of 3-10 oblong, acute, bifid, empty glumes, 1-2 ovate, many-nerved with the tip ciliate; flowering glumes 6-10, larger. Palea as long as the glume, keels white ciliate. Lodicules 3, winged, ciliate. Anthers obtuse, hairy, apiculate, purple. Ovary narrow, hairy; style long.

Locality: Cultivated in Bombay, Poona, Satara, Kolhapur and elsewhere.

Distribution: Mauritius, Bourbon, Madagascar, Hawaii, Java.—Cultivated in other countries.

*VAR. *STRIATA* Auct.

Bambusa strata Lodd. ex Lindl. in Penny Cyclop. III (1835) 357; Munro Monogr. 121; Curtis. Bot. Mag. XXX (1874) t. 6079.

Var. *vittata* A. & C. Rivière l. c.

B. vulgaris vel culmis variegatis Hort. Gall.

B. variegata Hort

Var. *aureo-variegata* Hort.

Vernacular names : Striped bamboo, Green striped bamboo.

Description : Rather smaller in size. The stems are striped with yellow and green, the stripes alternating at every node, the branchlets are yellow and the leaves somewhat smaller and paler. On drying the stripes disappear

Locality : Often cultivated in gardens

Distribution : Probably the result of cultivation in China and Japan

3. *BAMBUSA ARUNDINACEA* Retz.

Bambusa arundinacea Retz. Obs. V (1789) 24 sub *Bambos*; Willd. Sp. Pl. II (1799) 245, Roxb. Corom. Pl. I, 56, t. 79, Fl. Ind. II (1832) 191; Poir. Encycl. VIII, 701; Rupr. in Act. Acad. Caes. Petrop. (1840) 51, t. XIII, fig. 50, Munro Monogr. 103; Brandis Ind. Trees (1911) 617; Bedd. Fl. Sylv. CCXXI, Gamble Ind. Bamb. 52 et in Hook. f. Fl. Brit. Ind. VII, 395, Duthie Fodder Grasses N. Ind. (1888) 70; Cooke Fl. Bomb. II (1908) 1046; Camus Les Bambusées (1913) 128, pl. 75, fig. A.

B. Arundo Klein ex Nees in Linnaea IX (1834) 471.

B. Neesiana Arn. ex Munro l. c.

B. orientalis Nees l. c. 475.

B. pungens Blanco Fl. Filip. ed. I, 270

B. spinosa Roxb. Fl. Ind. II (1832) 198.

Arundo Bambos Linn. Sp. Pl. (1753) 81.

A. indica arborea Auct

Nastus arundinaceus Sm. in Rees Cycl. XXIV, no. 1.

Vernacular names : Kalak, Mundgay.

Etymology : *Arundinacea* means reed-like.

Description : Thorny; stems many, tufted on a stout rootstock, 24-30 m. high by 15-18 cm. diam., usually graceful and curving; nodes prominent (the lowest rooting), the lower emitting horizontal, almost naked shoots armed at the nodes with 2-3 stout recurved spines sometimes 2.5 cm. or more long; internodes up to 45 cm. long, walls 2.5-5 cm. thick, stem-sheaths coriaceous, variable in shape, up to 30-38 by 23-30 cm., striate, with rounded tip and plaited margins, when young orange yellow streaked with green or red and thickly ciliate with golden hairs, blade up to 10 cm. long, triangular, acuminate, glabrous outside, densely hirsute inside, the margins decurrent, thickly ciliate, ligule narrow, entire or fringed with pale hairs. Leaves up to 18-20 by 2.5 cm., linear or linear-lanceolate, tip stiff, glabrous or puberulous beneath, one or more margins scabrous, base rounded, ciliate, midrib narrow, nerves 4-6 with 7-9 intermediate and a few transverse pellucid glands; leaf-sheath ending in a thick callus and shortly bristly auricle; ligule short

Inflorescence an enormous panicle often occupying the whole stem, branchlets bearing loose clusters of pale, suberect, lanceolate, acute, glabrous spikelets 1.3-2.5 cm. by 5 mm. Involucral glumes 2 or 0, ovate-lanceolate, acute or mucronate, 5-8.5 mm. long, many-nerved, empty; floral glumes 3-7, the uppermost 1-3 male or neuter; palea subacute with 2 ciliate keels. Lodicules 3, ovate or subovate, hyaline, ciliate, 1-3-nerved. Anthers yellow, obtuse. Style short. Grain 5-8.5 mm. long, oblong, beaked by the style-base, grooved on one side.

Locality : Gujarat: (Gamble), Dangs (Woodrow).

Konkan Kanari Caves (McCann A215¹ A216¹), Wada Range (Ryan 494¹); Vetora (Sabnis 33282¹).

W. Ghats: (Gamble), Igatpuri (McCann A218¹), Khandala, St. Xavier's Villa (McCann A224¹ A225¹).

Deccan: Karli (Gammie 16169¹).

N. Kanara: Karwar (Hallberg & McCann A217¹); 3 miles from Mirjan (Hallberg & McCann A220¹).

Ecology : Gregarious along the banks of rivers and nalas on alluvial soil in moist monsoon-forests, absent from rain-forest. Flowers after long intervals. See E. Blatter, The Flowering of Bamboos in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 899, 34 (1930) 135, 34 (1930) 447.

Distribution : India, Burma, Ceylon.—Often cultivated.

Economic uses : The stems are used for construction, mats, baskets and many other purposes.

107 OXYTENANTHERA Munro.

Arborescent or scandent bamboos, usually of a medium or small size, unarmed, often gregarious; rootstock stout, usually creeping and stoloniferous; stem-sheaths various, usually rather narrow, the imperfect blade also narrow. Leaves variable, shortly petiolate.

Inflorescence a large panicle of spicate heads of few or many spikelets. Spikelets narrow, elongate, conical, 1-3-flowered, the uppermost usually fertile. Involucral glumes 1-3, empty; floral glumes ovate, elongate, mucronate. Palea of lower florets 2-keeled, of upper florets convolute with obscure or obsolete keel. Lodicules 0. Stamens 6; filaments connate in an ultimately elongated membranous tube. Ovary ovoid; style slender, stigmas 1-3, more or less plumose. Grain elongate, beaked, grooved, smooth.

Species 16.—Malay Peninsula, Siam, India, tropical Africa.—2 in the Bombay Presidency.

1. Spikelets 1-flowered; style glabrous 1. *O. Ritcheyi*.
2. Spikelets 2-flowered; style hairy 2. *O. Stocksii*.

1. OXYTENANTHERA RITCHEYI Blatter & McCann.

Oxytenanthera Ritcheyi Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 773.

Bambusa Ritcheyi Munro in Trans. Linn. Soc. 26 (1868) 113.

Oxytenanthera monostigma Bedd. For. Man. in Fl. Sylv. (1873) CCXXXIII, et Io. Pl. Ind. Or. (1874) 56, t. 234, Gamble Ind. Bambus. (1896) 74, t. 65; Cooke Fl. Bomb. II (1908) 1048; Brandis Ind. Trees (1911) 674; Talbot For. Fl. Bomb. II (1911) 571; Camus Bambusées (1913) 148; Troup Silv. Ind. Trees III (1921) 1006.

Schizostachyum hindostanicum Kurz in Proc. As. Soc. Beng. 52, II (1873) 252.

Why we made the change from *O. monostigma* to *O. Ritcheyi* is evident from the synonymy.

Vernacular name: Choua.

Etymology: *Oxytenanthera* is derived from *oxytes*, sharpness, and *anthera*, anther, alluding to the filaments being connate in an ultimately elongated membranous tube.

Description: A medium-sized bamboo; stems 3-4.5 m. high by about 2.5 cm. diam., solid, covered with soft pale yellow velvety tomentum; nodes not very prominent; internodes long; stem-sheaths 15-25 cm. long by 7.5 cm. broad at the base, narrowed to the 2-lobed tip; blade in the sinus imperfect, about 7.5 cm. long, linear-lanceolate, striate; ligule long, fimbriate. Leaves variable, pale green, 15-20 by 3-8 cm., linear-lanceolate, acuminate, unequally rounded at the base into a flat petiole, ending above in a setaceous twisted point, glabrous or nearly so above, sparsely hairy and pale beneath, midrib below yellow, shining; nerves 7-12; leaf-sheaths striate; ligule often 8-5 mm. long, acute or rounded.

Panicle large, terminal, of spicate branches bearing dense globular often large heads of spikelets up to 6-3 cm. diam. Spikelets 2-2.5 cm. long, less than 2.5 cm. broad, 1-flowered, with a long spinous apiculation, very numerous, the fertile and sterile about equal in numbers. Involucral glumes 2-3, mucronate, empty; floral glume long, narrow, linear-lanceolate, convolute, with a long mucro; palea shorter than its glume, concave, not keeled, obtuse. Stamens exserted; anthers long, bristly-apiculate, the bristles somewhat hairy at the tip. Style long, glabrous; stigma at length curved, thickened. Grain narrow, linear-oblong, grooved, tipped with the conic style-base.

Locality: *W. Ghats* (Talbot, Woodrow), Sakhar Pathar Hill near Lonavla (Woodrow); Mahabaleshwar (Fagan).

Deccan—Satara Ghats (Brandis); Poona District (Wroughton); Ahmednagar (Wilkins).

S. M. Country (Ritchie 820).

N. Kanara: (Woodrow); Waddermone (Talbot 252! 905!); Arbail Ghat (Talbot 906!); Arbail (Talbot 251! 857!); Guddehalli (Talbot 583!), Supa (Talbot!).

Ecology: Grows usually in moist monsoon-forest.—Clumps or single culms are often found in flower; sometimes there is a general flowering over considerable areas.—The culms often grow separately.

Distribution: W. Ghats of Bombay Presidency, Anamalais.

Economic uses: The wood is somewhat soft and, therefore, little used.

2. OXYTENANTHERA STOCKSII Munro.

Oxytenanthera Stocksii Munro in Trans. Linn. Soc. XXVI (1868) 130; Bedd. For. Man. in Fl. Sylv. (1873) CCXXXIII; Gamble Bamb. Brit. Ind. (1896) 75, t. 66, et in Hook. f. Fl. Brit. Ind. VII (1896) 403; Cooke Fl. Bomb. II (1908) 1048; Talbot For. Fl. Bomb. II, 570; Camus Les Bambusées (1913) 149.

Vernacular names: Chivari, Konda, Mes, Oor-eheme.

Description: A slender bamboo; stems 9 m. high by 2.5-3.8 cm. diam., grey-green, covered when young with a white or grey deciduous tomentum; nodes with a softly pubescent

ring; internodes 15-30 cm. long; stem-sheaths 15-23 cm. long by 7.5-18 cm. wide at the base, tapering upwards to a concavely truncate top, appressedly brown-hairy on the back, ciliate on the margins, blade imperfect, subulate, acuminate, rounded at the base and again expanded into a rounded, waved, long-fringed auricle on the top of the sheath, ligule 8.5 mm. long, deeply fimbriate, conspicuous. Leaves 10-20 by 1-2 cm., rounded or attenuated at the base into a very short petiole 2.5 mm. long, the top ending in a setaceous point, glabrous or nearly so above, glabrous or hairy below, with scabrous margins, midrib narrow, nerves 5-6; leaf-sheaths striate, glabrous or at first pubescent; ligule long dentate.

Panicle large, of spicate heads reaching 2.5 cm. diam., with many closely packed spinous spikelets, the heads supported by rounded chaffy bracts. Spikelets 10-13 mm. long, narrow, glabrous, mucronate, many fertile mixed with a few sterile. Involucral glumes 2, ovate, mucronate, 5-7-nerved, then 2 hermaphrodite florets; floral glumes ovate, subacute, with a strong mucro from the back, palea of the lower floret as long as the floret, 5-nerved between the 2 ciliate keels, obtuse, that of the upper floret concave, convolute, obtuse. Stamens long-exserted; anthers short, acute. Ovary ovoid, hairy, style long, hairy; stigma simple, plumose.

Locality: Konkan (Stocks)

W. Ghat Panchgani, planted (Woodrow).

N. Kanara. Kumpta, cultivated (Talbot 269 '3601'), Karwar (Talbot 856 !); commonly cultivated along the coast, rare in the Ghat forests of N. Kanara (Talbot).

Ecology: Commonly cultivated in the Konkan and N. Kanara, near coast villages.

Distribution: W. Peninsula, Indo-China.

Economie uses: This is a stout strong bamboo with a small hollow; used for construction, umbrellas, baskets and punting poles

108. DENDROCALAMUS Nees.

Arborescent unarmed bamboos with densely branching rootstocks. Leaves shortly petiolate, the transverse nervules represented by pellucid glands

Spikelets in globose clusters on the long branches of a compound panicle, ovoid, 2-6-flowered. Involucral glumes 2-3, empty, ovate, acute, many-nerved, floral glumes like the empty; palea of lower florets keeled, of the upper dorsally rounded, ciliate. Lodicules rare. Stamens 6; filaments free. Ovary hairy above, often depressed, stigma usually simple. Grain small; pericarp coriaceous or crustaceous.

Species 24.—Africa, Indo-Malaya, Philippines, China.

1. Stem-sheaths 7-30 cm. long; leaves up to 25 by 3 cm. 1. *D. strictus*.
2. Stem-sheaths 50 cm. long, as broad at the base, leaves up to 50 by 10 cm. 2. *D. giganteus*.

1. DENDROCALAMUS STRICTUS Nees

Dendrocalamus strictus Nees in Linnaea 9 (1834) 476, Munro Monogr. 147, Bedd. Fl. Sylv. t. CCCXXV, Brandis Ind. Trees (1911) 675, Duthie Fodder Grasses N. Ind. (1888) 71; Gamble Bamb. Brit. Ind. (1896) 78; t. 68 69 et in Hook. f. Fl. Brit. Ind. VII (1896) 404; Cooke Fl. Bomb. II (1908) 1049, Camus Les Bambusées (1913) 152, pl. 87, fig. B.

Bambos stricta Roxb. Corom. Pl. I, 58, t. 80.

Bambusa stricta Roxb. Fl. Ind. II (1832) 193, Dalz. & Gals. Bomb. Fl. (1861) 299

B. verticillata Rottl. ex Munro in Trans. Linn. Soc. XXVI (1868) 147.

B. pubescens Lodd. ex Lindl. in Penny. Cycl. III (1835) 357.

B. Tanaea Ham. ex Wall. Cat. no. 5038A.

Vernacular names: Kania bans, Mes, Shib, Basa, Bans, Medar, Mace, Udha, Male bamboo.

Etymology: *Strictus* means close or narrow and upright or very straight.

Description: A deciduous densely tufted bamboo with strong stems 6-15 m. high by 2.5-7.5 cm. diam., which are solid or only with a small cavity, glaucous-green when young, dull green or yellowish when old, nodes swollen, the lower often rooting, internodes 30-45 cm. long, upper branches decurved; stem-sheaths variable, the lower 7.5-30 cm. long, covered on the back with golden-brown stiff hairs (or in dry localities sometimes glabrous), striate, rounded on the top, ciliate on the margins, very slightly auricled, the imperfect blade triangular-subulate, hairy on both sides, especially so within; ligule narrow. Leaves 2.5-5 cm. long in dry localities, up to 25 cm. long in moist ones, 0.6-3.2 cm. broad, rounded suddenly at the base into a short petiole, gradually narrowed upwards into an acuminate twisted point, rough and often hairy above, softly hairy beneath, with scabrous margins; nerves 3-6 pairs, with interposed pellucid glands, leaf-sheaths striate, hairy; callus prominent, auricle short, ciliate with a few wavy deciduous hairs; ligule narrow, serrate.

Inflorescence a large branching panicle of dense globular heads about 2.5 cm. diam., 3-8.5 cm. apart; rhachis rounded, smooth. Spikelets usually hairy, spinescent, the fertile intermixed with many sterile smaller ones, 8.5-13 by 2.5-5 mm., with 2-3 fertile florets. Involucral glumes 2 or more, ovate, spinescent, many-nerved, floral glumes ovate, ending in a sharp spine, surrounded by ciliate tufts of hairs; palea ovate or obovate, emarginate, the lower ones 2-keeled, the uppermost keelless, 6-8-nerved. Stamens long-exserted; anthers yellow, shortly apiculate. Ovary stipitate, turbinate; style long; stigma simple, plumose. Grain 8.5 mm. long, ovoid to subglobose, brown, shining, hairy above, beaked with the persistent style-base.

Locality : Sind · Junnar Hill (Burns!).

Kathawar : Junagad, Datar Hill (Chibber!).

Gujarat : Panch Mahals (Woodrow)

Khandesh : To Toranmal (McCann 9791!); base of Toranmal (McCann A221!).

Konkan : Planted (Woodrow).

Deccan : Rocky hills (Gamble), Karli (Gammie 16167!); Ganeshkhund Botanic Gardens (Patwardhan!).

S. M. Country : Byadgi, Dharwar District (Talbot!).

N. Kanara : Karwar (Talbot!), Ambgaum (Talbot 1788!); Dongi Nallah (Talbot 959!).

Ecology : Gregarious over large areas in N. Kanara, S. Mahratta Country, Deccan and Konkan.—Flowers irregularly and sporadically or simultaneously over large areas.

Distribution : India, Java

Economic uses : This strong elastic bamboo is used for building purposes, matting and basket work, spear-handles, punting poles, furniture, etc.—The leaves are a good fodder. See : D. Clouston and F. J. Plymen, *Principal Fodders in the Central Provinces and Berar* including the small bamboo Agr. Journ. India XV (1920) 380.

*2. DENDROCALAMUS GIGANTEUS Munro.

Dendrocalamus giganteus Munro in Trans. Linn. Soc. XXVI (1868) 150; Kurz Ind. Forester I, 346. Gamble Bamb. Brit. Ind. (1896) 88, t. 76, et in Hook. f. Fl. Brit. Ind. VII (1896) 406; Brandis Ind. Trees (1911) 678; Cooke Fl. Bomb. II (1908) 1050; Camus Les Bambusées (1930) 159, pl. 85, f. A.

Bambusa gigantea Wall. Cat. Bot. Gard. Calc. 79; Gardener's Chronicle pl. Sept. 1892.

Vernacular name : Giant bamboo.

Description : Stems 20-30 m. by 20-25 cm. in diam., branched above; nodes hairy, internodes rather short, grey-green, young with waxy scurf; walls thin. Stem-sheaths 50 cm. long, as broad at the base, deciduous, thinly strigose with golden hairs, top depressed; blade 12-40 by 9 cm., decurrent into glabrous, stiff, brown, wavy auricles, narrowed above into a short point, ligule 5-12 cm., stiff, black, margin serrate. Leaves up to 50 by 10 cm., oblong, cuspidately acuminate, tips twisted, young hairy beneath, midrib strong, nerves 12-16 pairs, with pellucid cross bars.

Panicle very large, branchlets slender, curved; heads up to 2.5 cm. diam., 1.2-2.5 cm. apart. Spikelets 12 mm. long, ovoid, acute, spinescent puberulous, sometimes all flowering; rhachilla produced with an imperfect glume. Involucral glumes ovate, mucronate, striate; flowering glumes 3-6, thin, mucronate, many-nerved. Anthers acuminate. Ovary ovoid and long style hairy; stigma simple. Grain oblong, obtuse, hairy above.

Locality : Sometimes grown in gardens

Distribution : India (Tenasserim, Malay Peninsula, Penang, Malacca, Perak), Cochin-China.—Cultivated in gardens of India, Ceylon and Europe.

109. TEINOSTACHYUM Munro.

Stems thin, overhanging, sometimes climbing. Stem-sheaths usually thin. Leaves various.

Panicle spiciform, on leafy branches. Spikelets up to 7.5 cm. long, slender, many-flowered, sometimes pedunculate, in bracteate whorls, upper and lower flowers imperfect. Involucral glumes 1-2, mucronate, flowering glumes similar, mucros longer. Palea convolute, keels ciliate. Lodicules 3, 3-9-nerved. Stamens 6, filaments free, slender. Anthers obtuse or obtusely apiculate. Ovary ovoid or depressed globose, apex produced enclosing the style; stigmas 2-3, plumose. Grain ovoid, acuminate, beaked, pericarp crustaceous.

Species 5.—India, Ceylon.—One species in the Bombay Presidency; not mentioned by Cooke.

1. TEINOSTACHYUM WIGHTII Bedd.

Teinostachyum Wightii Bedd. Fl. Sylv. t. CCCXXXIII, Forest Man. CCXXXIII (excl. syn.); Gamble Bamb. Brit. Ind. (1896) 99, t. 87, et in Hook. f. Fl. Brit. Ind. VII (1896) 410;

Brandis Ind. Trees (1911) 679, Camus Les Bambusées (1913) 163.

Etymology : *Tenostachyum* is derived from *teno*, to stretch, extend, and *stachys*, an ear, fruit, perhaps alluding to the spiciform panicle.

Description : Stem 3-6 m. by 2.5-3 cm., semiscandent; branches pendulous; nodes narrowly ringed; internodes bright green, rough above, walls thin. Stem-sheaths 25-30 by 2.5-3 cm., papery, hirsute with black-brown hairs, top truncate, not auricled; blade subulate, 12-17 cm., decurrent on the sheath; ligule 2-5 mm. Leaves, 15-40 cm. by 2.5-5 cm., oblong-lanceolate, acuminate, tip scabrous, twisted, whitish and sparsely hairy beneath, midrib broad, yellowish, nerves 6-7 pair, tessellate by glands, sheath glabrous; ligule narrow.

Panicle large, with spiciform drooping branchlets; rachis smooth, slender; rachilla of spikelets slender, flattened and concave below, thickened and ciliate above. Spikelets 12-25 mm. Involucral glume 1, ovate, mucronate, 5-7-nerved, dorsally hirsute; flowering glumes 1 or 2, mucronate, nerved transversely. Lodicules ovate, short-ciliate, 3-5-nerved. Ovary stalked, depressed-globose, smooth, style included in the long beak of the ovary. Grain stoutly stalked, ovoid, beaked, glabrous.

Locality : Ghats of N. Kanara (ex Gamble and Camus).

Distribution : Nilgiris, Anamalais, about 3,300-5,000 ft. altitude.¶

110. *OCHLANDRA* Thw.

Shrubby gregarious reed-like bamboos, stems small, thin-walled, erect; internodes rather long, stem-sheaths thin, persistent, auricles small. Leaves small to moderate-sized, linear or oblong-lanceolate, acuminate, shortly petiolate, leaf-sheaths striate, fringed; ligule usually short.

Inflorescence a terminal spike or spike-like panicle on a leafy branchlet; spikelets verticillate, partly fertile, partly sterile. Spikelets 1-flowered, often very large. Involucral glumes 2-6, variable, usually mucronate, empty; floral glume similar to the last involucral glume, mucronate. Palea membranous, not keeled. Lodicules 1-several, conspicuous, variable, usually appressed to the filaments. Stamens many, from 6 to 120; anthers large, narrow, usually apiculate. Ovary narrow; style elongate, stigmas 4-6, plumose or papillose. Grain large or very large, ovoid, long-beaked, supported by the persistent glumes, pericarp very thick, fleshy.

Species 11.—India, Ceylon, Malay Peninsula, Java, Madagascar.

Only one species in the Bombay Presidency.

1. *OCHLANDRA TALBOTI* Brandis.

Ochlandra Talboti Brandis Ind. Trees (1906) 684; Talbot For. Fl. Bomb. II (1911) 572; Cooke Fl. Bomb. II (1908) 1050; Camus Les Bambusées (1913) 181.

O. stridula Woodr. in Journ. Bomb. Nat. Hist. Soc. XIII (1901) 442 (non Thw.).

Ochlandra Rheedia var. *Svagrana* Gamble which Talbot (l. c.) identifies with *Ochlandra Talboti*, has been described as a distinct species by Camus under the name *Ochlandra Svagrana* in Les Bambusées (1913) 181.

Vernacular names: Huda, Wontenuly.

Etymology : *Ochlandra* may have been derived from *ochleo*, to throw into confusion and *aner*, stamen, on account of the great number of stamens (6-120).

Description : Stems numerous in dense clumps, slender, 13-20 mm. diam., hollow, sometimes scandent; nodes thickened, shining, glabrous. Leaves glabrous, pale, lanceolate, long-acuminate, 20-30 by 3.8-6.3 cm., on a petiole 6 mm. long; leaf-sheaths glabrous, the bristles at the mouth early deciduous; ligule bearded.

Spikelets in half whorls on a terminal erect spike 10-20 cm. long, glabrous or with a few soft hairs at the tips of the glumes, the fertile spikelets few, 3-2 cm. long. Involucral glumes 3-6, empty. Lodicules 6, linear, nerved. Stamens 25-40; anthers 13 mm. long, minutely apiculate; filaments long, slender. Ovary prolonged into a slender style 3.8 cm. long; stigmas 5, papillose. Grain ovoid, 5-7.5 mm. by 8-5 mm., narrowed into a long beak, supported by 4 persistent glumes.

Easily recognized by the hollow stem.

Locality : N. Kanara: Gersoppa Falls (Talbot 3628!, McCann!), Katgal (Talbot 3506!, McCann!); Yellapur (Bell!); near Sulgeri (Bell 3357!), Dadmune (Talbot!), common throughout the Kanara forests (McCann!); Honavar, at Alanka (McCann!).

Ecology : Grows in monsoon and rain forest often along the banks of rivers and nalas on the S. Ghats.—Flowers at great intervals.

Distribution : Endemic in N. Kanara.

THE BOMBAY GRASSES.

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LIST OF SPECIES—*contd.*

	Sind	Cutch.	Kathiawar	Gujarat	Khandesh.	Konkan	W. Ghats	Deccan.	S. M. Country.	N. Kanara.
<i>Coelorhachis</i> Clarkei Blatter & McCann										*
<i>Imperata</i> cylindrica P. Beauv.	*			*		*	*		*	*
<i>Saccharum</i> spontaneum Linn. *officinarium Linn. *arundinaceum Retz. Munja Roxb. Griffithii Munro Ravennae Linn. fastigiatum Steud.	* * * * * * *			*	*	*	*	*	*	*
<i>Spodiopogon</i> albidus Benth.					*	*	*	*	*	*
<i>Eulalia</i> argentea Brogn. fimbriata Blatter & McCann					*	*	*	*	*	*
<i>Sorghum</i> halapense Pers. subglabrescens Schweinf. & Aschers. purpureo-ariceum Aschers. & Schweinf. nitidum Pers. *vulgare Pers.				*	*	*	*	*	*	*
<i>Cleistachne</i> Stookau Hook. f.						*				
<i>Vetiveria</i> Lawsoni Blatter & McCann rizanoides Stapf				*		*			*	*
<i>Chrysopogon</i> Gryllus Trin. aciculatus Trin. asper Hayne lanceolatus Haines Wightianus Nees montanus Trin. polyphyllus Blatter & McCann Aucherii Stapf	* * * * * * *		*	*	*	*	*	*	*	*
<i>Arthraxon</i> inermis Hook. f. serrulatus Hochst. Meiboldii Stapf lanceifolius Hochst. quartimanus Nash jubatus Hack.	* * * * * *		*	*	*	*	*	*	*	*
<i>Cephalopodium</i> assimile A. Camus Hughesii Blatter & McCann filiculme Blatter & McCann					*	*	*	*	*	*
<i>Amphilophus</i> compressa Blatter & McCann Woodrowii A. Camus pertusa Stapf Kuntzeana Haines ensiformis Blatter & McCann concoloratus Blatter & McCann glabra Stapf odorata A. Camus				*		*	*	*	*	*
<i>Dichanthium</i> panchganianse Blatter & McCann armatum Blatter & McCann McCannii Blatter caricosum A. Camus annulatum Stapf serrafalcoides Blatter & McCann	* * * * * *			*	*	*	*	*	*	*
<i>Eremopogon</i> foveolatus Stapf Paranypyceanum Blatter & McCann	* *	*		*	*	*	*	*	*	*

	Sind.	Orchh.	Kashmir.	Gujarat.	Khandesh.	Konkan.	W. Ghats.	Deccan.	S. M. Country.	N. Kanara.
<i>Schizachyrium brevifolium</i> Nees									•	
<i>Andropogon pumilus</i> Roxb				•	•		•	•	•	•
<i>Cymbopogon Schoenanthus</i> Spreng. <i>Jwarancusa</i> Schnlt. * <i>citrus</i> Stapf <i>Martini</i> Stapf <i>caesus</i> Stapf	•	•	•	•	•		•	•	•	
<i>Heteropogon oliganthus</i> Blatter & McCann <i>polystachyos</i> Blatter & McCann <i>inaguus</i> Thw. <i>Ritchii</i> Blatter & McCann <i>confertus</i> Roem. & Schnlt. " var. <i>genuinus</i> , subv. <i>typicus</i> " var. <i>genuinus</i> , subv. <i>hapdusimus</i>			•		•	•	•	•	•	•
<i>Isaulema anthephoroides</i> Hack. <i>laxum</i> Hack. <i>Wightii</i> Anders.			•	•	•	•	•	•	•	•
<i>Themeda triandra</i> Forsk. <i>quadrivalvis</i> O. Kuntze <i>cymbaria</i> Hack. <i>tremula</i> Hack.				•	•	•	•	•	•	•
<i>Pseudanthus</i> <i>hispida</i> Hook. f. <i>heteroclita</i> Hook. f. <i>umbellata</i> Hook. f.				•	•	•	•	•	•	•
<i>Spinifex squarrosus</i> Linn.				•		•				•
<i>Digitaria ternata</i> Stapf <i>marginata</i> Link. var. <i>fimbriata</i> Stapf <i>pennata</i> Choiv <i>peducellaria</i> Prain <i>longiflora</i> Pers <i>Royleana</i> Prain	•	•	•	•	•		•	•	•	•
<i>Alloterpis ormicina</i> Stapf						•	•	•	•	•
<i>Pseudochloa polystachya</i> Stapf									•	•
<i>Eriochloa ramosa</i> O. Kuntze	•			•					•	•
<i>Brachiaria Isachne</i> Stapf * <i>mutica</i> Stapf <i>ramosa</i> Stapf <i>distachya</i> Haines	•	•		•	•	•	•	•	•	•
<i>Paspalum scrobiculatum</i> Linn. * <i>dilatatum</i> Poir. <i>compactum</i> Roth <i>vaginatum</i> Sw	•				•	•	•		•	•
<i>Paspalum flavidum</i> A. Camus <i>punctatum</i> A. Camus <i>geminatum</i> Stapf	•	•	•	•	•	•		•	•	•
<i>Urochloa reptans</i> Stapf <i>setigera</i> Stapf <i>marathensis</i> Henr. <i>Helopus</i> Stapf	•		•	•	•	•		•	•	•

THE BOMBAY GRASSES.

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LIST OF SPECIES—*contd.*

	Sind.	Cutch.	Kathiawar.	Gujarat.	Khandesh.	Konkan.	W. Ghats.	Deccan	S M Country	N Kanara.
<i>Echinochloa</i>										
<i>colona</i> Link	*	*	*	*	*	*	*	*	*	*
" *var. <i>frumentacea</i> Blatter & McCann										
<i>Crus-Galli</i> P. Beauv.	*			*		*	*	*	*	*
<i>stagnina</i> Beauv.	*									
<i>Opismenus</i>										
<i>compositus</i> P. Beauv.				*	*	*	*	*	*	*
<i>Burmanni</i> P. Beauv.										
<i>Hymenachne</i>										
<i>myuros</i> Beauv.									*	
<i>Panicum</i>										
<i>turgidum</i> Forst.	*		*							
<i>obscurum</i> Woodrow								*		
<i>trypheron</i> Schult.				*		*		*		
<i>palupodium</i> Trin.				*				*		
* <i>miliaceum</i> Linn.										
* <i>miliare</i> Lam.										
<i>subglume</i> Trin.									*	
* <i>maximum</i> Jacq.									*	
<i>paludosum</i> Roxb.	*	*	*			*	*	*	*	*
<i>antidotale</i> Retz.						*	*	*	*	*
<i>montanum</i> Roxb.						*	*	*	*	*
<i>auritum</i> Presl.							*			
<i>Sacciolepis</i>										
<i>indica</i> Chase						*	*		*	*
<i>myosuroides</i> Haines						*	*		*	*
<i>interrupta</i> Stapf.	*					*	*		*	*
<i>Pseudoraphis</i>										
<i>aspera</i> Pilger						*	*		*	*
<i>Cyrtococcum</i>										
<i>trigonum</i> A. Camus							*		*	*
<i>pilipes</i> A. Camus						*	*		*	*
<i>patens</i> A. Camus						*	*		*	*
<i>Setaria</i>										
<i>plicata</i> T. Cooke						*	*		*	*
<i>homonyma</i> Chiov.						*	*		*	*
<i>glauca</i> Beauv.				*	*	*	*	*	*	*
<i>intermedia</i> Roem. & Schult.				*	*	*	*	*	*	*
<i>verticillata</i> Beauv.	*	*	*	*	*	*	*	*	*	*
* <i>italica</i> Beauv.						*				
<i>Tricholaena</i>										
<i>Teneriffae</i> Parl.	*					*	*	*	*	
<i>Wightii</i> Nees										
<i>Pennisetum</i>										
<i>Alopecurus</i> Nees	*			*	*		*	*	*	*
<i>dichotomum</i> Del.	*			*	*		*	*	*	*
<i>orientale</i> Rich.	*			*	*	*	*	*	*	*
<i>pedicellatum</i> Trin.	*		*	*	*		*	*	*	*
<i>setosum</i> Rich.	*	*	*	*	*		*	*	*	*
<i>cinare</i> Link.	*	*	*	*	*		*	*	*	*
* <i>epicatum</i> Roem. & Schult.							*	*	*	*
* <i>purpureum</i> Schum. & Thonn.										
<i>Cenchrus</i>										
<i>biflorus</i> Roxb.	*			*	*					
<i>catharticus</i> Del.	*	*		*	*					
<i>Isachne</i>										
<i>Lasiocha</i> Hook. f.						*	*	*	*	*
<i>elegans</i> Dalz.						*	*	*	*	*
<i>australis</i> R. Br.				*		*	*	*	*	*
<i>mitis</i> Roth						*	*	*	*	*

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	Sind.	Cutch.	Kathawar	Gujarat.	Khandesh	Konkan.	W Ghats	Deccan	S M. Country	N Kanara
Sporobolus										
dander Beauv	*			*		*	*		*	*
sindicus Stapf	*									
indicus R. Br						*	*	*		*
minutiflorus Link	*									
oclados Nees	*									
virginicus Kunth			*							
glaucofolius Hochst.	*			*		*			*	
tremulus Kunth				*					*	
orientalis Kunth		*		*					*	*
piliferus Kunth	*						*		*	
palidus Boiss									*	
scabrifolius Bhde	*			*	*			*	*	
coromandelianus Link									*	
Eragrostis										
rupestris Steud				*						
aspera Nees						*				
ciliatus Link	*	*	*	*	*	*			*	*
tenella Beauv. var plumosa Stapf	*			*	*	*			*	*
viscosa Trin			*	*	*	*		*	*	*
interrupta Beauv.	*			*	*	*		*	*	*
unoloides Nees	*				*	*		*	*	*
gangetica Steud					*	*		*	*	*
nutans Nees	*				*	*		*	*	*
biharensis Link.	*		*		*	*		*	*	*
minor Host	*			*	*	*		*	*	*
tremula Hochst.		*				*		*	*	*
tenuifolia Hochst.	*					*		*	*	*
papposa Steud.	*					*		*	*	*
pilosa Beauv						*	*	*	*	*
bifera Wight							*	*	*	*
brachyphylla Stapf				*					*	
Halopyrum										
mucronatum Stapf	*		*							
Leptochloa										
contracta Blatter & McCann				*		*				
chinensis Nees				*		*			*	
Desmostachya										
bipinnata Stapf	*	*	*	*		*		*		
Diplachne										
fusca Beauv	*					*				*
Oropetium										
Thomaeum Trin.						*		*	*	
Microchloa										
indica Beauv									*	
Gracile										
Royleana Hook. f		*		*	*			*	*	*
" var plumosa Hook. f.	*					"		*	*	*
Cynodon										
dactylon Pers.	*	*	*	*	*	*	*		*	*
Enteropogon										
badamicum Bhide									*	
Chloris										
palida Hook f.				*			*	*		*
incompleta Roth				*	*		*	*	*	*
tenella Koen				*	*		*	*	*	*
villosa Pers.	*			*	*		*	*	*	*
virgata Sw	*			*	*	*	*	*	*	*
barbata Sw	*			*	*	*	*	*	*	*
montana Roxb.	*			*	*	*	*	*	*	*
quinquesetia Bhide	*	*						*	*	*
*gayana Kunth										*
Eleusine										
indica Gaertn.		*			*		*	*	*	*
*coracana Gaertn.					*		*	*	*	*
verticillata Roxb.					*			*	*	*
flagellifera Nees	*	*			*			*	*	*
brevifolia R. Br					*			*	*	*

[illegible]

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**Errata to Scientific Monograph No. 5 of the Imperial Council of
Agricultural Research entitled 'The Bombay Grasses', by
E. Blatter and C. McCann.**

- Page vi, item 124, for ' *Arundineua* ' read ' *Arundanella* '
- Page xv, line 3, for ' involucrant ' read ' involucral '
- Page 3, line 3 of footnote, for ' traumatism ' read ' traumatisme '
- Page 3, line 5 of footnote, from bottom Add fullstop after ' Missbildungen '
- Page 3, line 2 of footnote from bottom Add fullstop after ' l'embryon '
- Page 4, line 9 from bottom, for ' Dymnock ' read ' Dymock '
- Page 29, line 22 from bottom, for ' Birt ' read ' Brit '
- Page 36, under Explanation of Plate 25, after the bracket, for ' spikete ' read ' spikelet '
- Page 37, line 29, for ' of ' read ' at '
- Page 43, line 13, for ' seems ' read ' seem '
- Page 43, line 16, for ' Oocology ' read ' Oecology '
- Page 44, line 26, for ' hullum ' read ' hilum '
- Page 44, line 31, for ' spikele ' read ' spikelet '
- Page 49, line 5, for ' adaptions ' read ' adaptations '
- Page 49, line 2 from bottom Add ' rather ' after ' generally '
- Page 52, under Explanation of Plate 34, after bracket, for ' Sessle ' read ' Sessile '
- Page 55, line 26 from bottom, for ' on the so widely spread a genus like *Sorghum* ' read ' on so widely spread a genus as *Sorghum* '
- Page 85, line 28. Delete comma after ' College '
- Page 105, line 33, for ' Russa ' read ' Rusa '
- Page 112, line 25 from bottom. Add ' as ' after ' long '
- Page 122, line 17, for ' xi ' read ' xv '
- Page 123, line 4, for ' Jehu ' read ' juhu '
- Page 128, line 17. Add semi-colon after ' Ceylon '
- Page 136, line 7 from bottom, for ' Commersoni ' read ' Commersonu '
- Page 137, line 22, for ' Commerson ' read ' Commersonu '
- Page 141, line 12 from bottom, for ' indigestable ' read ' indigestible '
- Page 141, line 12 from bottom, for ' are ' read ' is a '
- Page 161, line 2 Add ' it is ' after ' but '
- Page 162, line 24 from bottom, for ' Yemem ' read ' Yemen '
- Page 176, line 5. Add ' for ' after ' and '
- Page 176, line 24 from bottom, for ' Tenerife ' read ' Teneriffe '
- Page 178, line 23, for ' *Alopecuros* ' read ' *Alopecurus* '

Page 181, line 14, *for* ' *Alopecurus* ' *read* ' *Alopecuros*

Page 202, line 3 from bottom, *for* ' *maur anica* ' *read* ' *mauritanica*

Page 202, line 2 from bottom, *for* ' *n palensis* ' *read* ' *nepalensis* '

Page 207, lines $\left. \begin{array}{c} 9 \\ 28 \end{array} \right\}$ *for* ' Brogn ' *read* ' Brongn '

Page 215, line 3 from bottom, *for* ' from ' *read* ' form '

Page 231, line 11, *for* ' Isle of France ' *read* ' Mauritius '

Page 232, line 15, *for* ' Général ' *read* ' Générale '

Page 275, line 15, *for* ' Pl Aliment des Pays Chaudes ' *read* ' pl aliment des pays
chauds '

Page 280, line 26 *Add* semicolon after ' Butler '